TM 11-5895-219-24

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

ORGANIZATIONAL AND FIELD MAINTENANCE

RADIO RECEIVER-SELECTORS R-196C/ARW-26Y AND R-196D/ARW-26Y

HEADQUARTERS, DEPARTMENT OF THE ARMY

JULY 1959

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *15 July 1959*

TM 11-5895-219-24 (a reprint of an Air Force-Navy publication) is published for the use of Army personnel.

[AG 413.44 (24 Jun 59)]

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Units org under fol TOE:

11-7 (2)
11-16 (2)
11-57 (2)
11-98 (2)
11-117 (2)
11-155 (2)
11-500 AA-AE (2)
11-587 (2)
11-592 (2)
11-597 (2)

NG: State AG (3).

USAR: None.

For explanation of abbreviations used, see AR 320-50.

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SECTION I

DESCRIPTION OF LEADING PARTICULARS

1-1. INTRODUCTION. (See figure 1-1.)

1-2. This publication is issued as the basic Handbook of Service Instructions for the Radio Receiver-Selector R-196C/ARW-26Y and R-196D/ARW-26Y, manufactured by Radioplane Company, Van Nuys, California. The following data applies to both models R-196C/ARW-26Y and R-196D/ARW-26Y. The units are interchangeable and are essentially the same in function and performance. However, there are slight differences in appearance, electrical components, and characteristics between the two models. Since this handbook contains service instructions for both models, the differences will be noted within the text and illustrations.

1-3. This handbook contains descriptive data and illustrated instructions which are incorporated to facilitate service and maintenance of the subject equipment. Detailed information concerning characteristics, required test equipment, preparation for use, operational principles, operational and field maintenance is also included.

1-4. PURPOSE OF EQUIPMENT.

1-5. Both the R-196C/ARW-26Y and R-196D/ARW-26Y are designed to function as control receivers for radio controlled target drones. The receivers are employed in conjunction with associated ground control transmitting equipment and an airborne servo system to direct flight operation of the target drone within which they are installed. The purpose of the equipment is to relay flight control intelligence from the transmitter carrier to the servo system and thus provide remote flight control of the aerial target. The equipment can be employed to

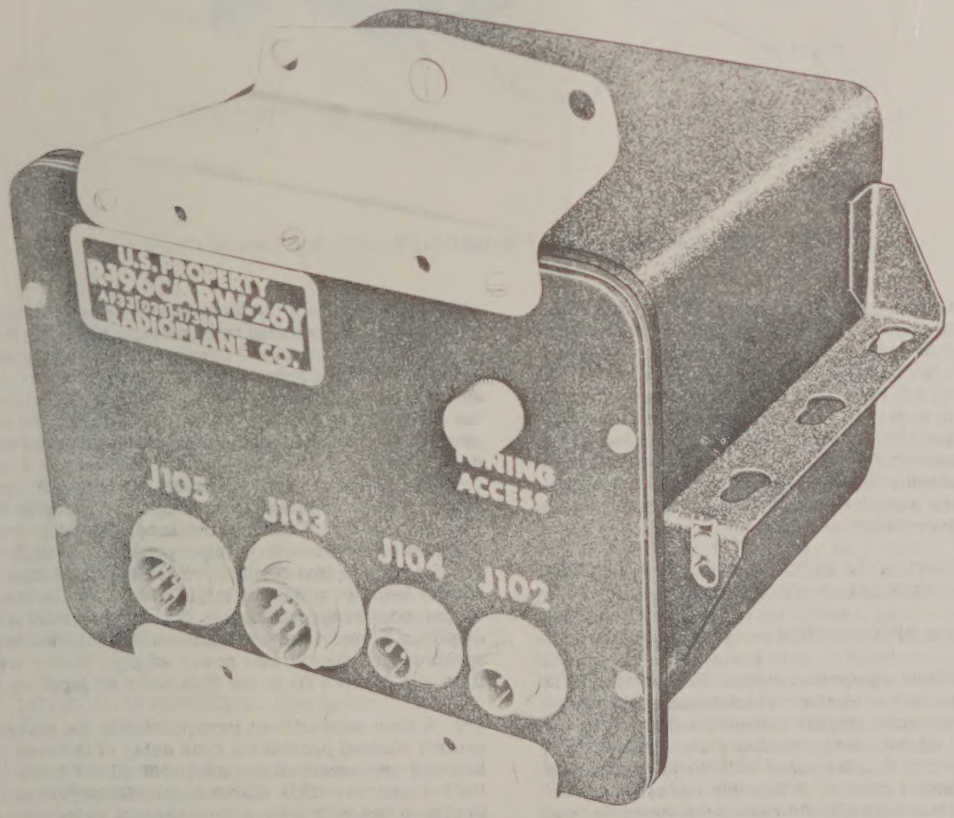

Figure 1-1. Radio Receiver-Selector R-196C/ARW-26Y and R-196D/ARW-26Y, Assembled View

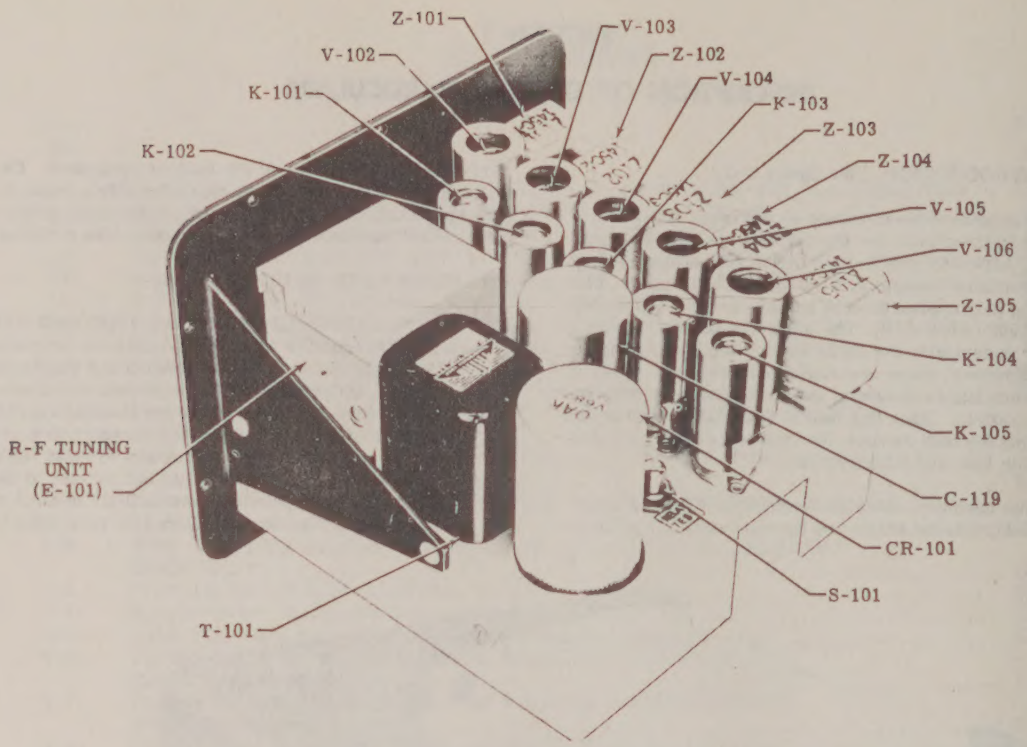

Figure 1-2. Radio Receiver-Selector R-196C/ARW-26Y, Top View of Chassis

provide both out-of-sight flight control and in-sight flight operation when used in conjunction with the proper type of servo system and a suitable tracking means. The receiver can also be used wherever the need of a 57 to 74 megacycle, AM radio control receiver-selector exists in addition to serving as a control receiver for target aircraft. Specific examples of these uses include a control receiver for guided missiles and a control receiver-selector for remote bomb release systems. The receivers were designed to be interchangeable with Radio Receiver-Selector RPR-1A.

1-6. DESCRIPTION OF RADIO RECEIVER-SELECTOR R-196C/ARW AND R-196D/ARW-26Y.

1-7. CIRCUIT DESCRIPTION.

1-8. The subject equipment consists essentially of a super-regenerative receiver which is provided with a tuned r-f input, audio amplifier stages, and separate selective audio circuits to operate five control relays. The receiver has an r-f tuning range of 57 to 74 megacycles and is designed to receive, within this tuning range, r-f signals which are amplitude modulated by audio frequencies of 300, 650, 1390, 3000 and 955 cycles per second. Although all units are tuned to 73 megacycles when delivered from the factory, any desired reception frequency can be selected by adjustment of the r-f tuning slug. Reception of an r-f carrier modulated by one of the five specified a-f tones causes the corresponding one of five control relays to be actuated. Actuation of the control relay provides a ground return for the servo system or parachute release mechanism installed within the target drone and thus permits flight control of the aerial target. Four relays control the right, left, up and down movements of the target drone and the fifth relay controls the target drone parachute. The receiver is designed to operate with an input potential of +26.5 volts dc which is supplied during normal flight operation by a battery installed within the target drone. The necessary B+ potential of approximately 225 volts dc at 20 milliamperes is provided by a self-contained, full-wave, synchronous type vibrator power supply. Heater potentials are derived from the 26.5 volts dc input supply.

1-9. A time delay circuit incorporated in the parachute control channel provides a time delay of between one-half and one second after removal of all a-f tones from the r-f carrier. This allows a specific period of time to elapse before the parachute control relay becomes de-energized and releases the parachute. This provision prevents the parachute from being released by

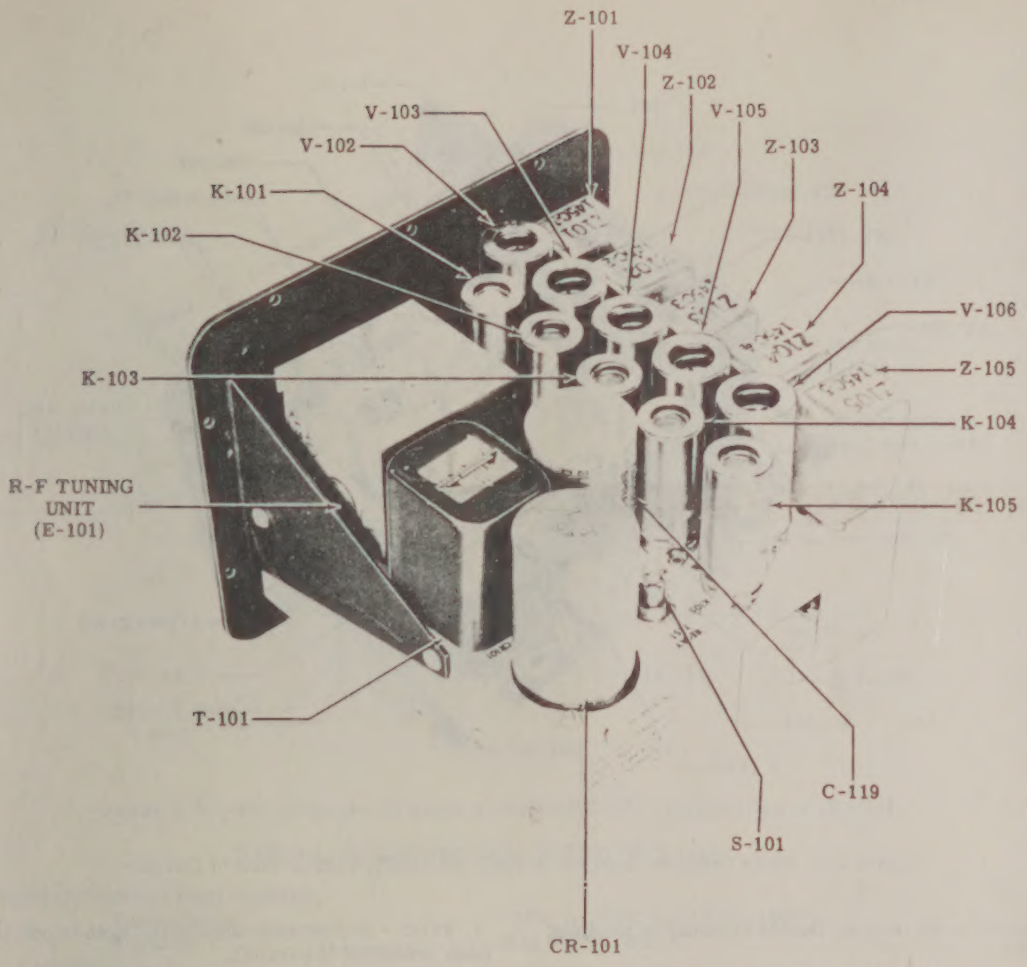

Figure 1-3. Radio Receiver-Selector R-196D/ARW-26Y, Top View of Chassis

an instantaneous loss of signal or similar occurrence.

1-10. Provisions for measuring relay current and aural monitoring the a-f signal using headphones are incorporated in connector receptacle "J-103". These measurements and monitoring may be accomplished through the use of Test Set TS-257/ARW when the R-196C/ARW-26Y or R-196D/ARW-26Y is installed within the target drone. Aural monitoring may also be performed when using Radioplane Test Set Drawing/Part No. 225A.

1-11. PHYSICAL DESCRIPTION. (See figures 1-2, 1-3, 1-4, 1-5 and 1-6.)

1-12. Component parts of the receiver are housed on or within a rectangular, waterproof, aluminum case. The case exterior is provided with mounting brackets which will accommodate Type FT-441-B shock mounts. An alternate mounting method is provided through the use of two angle mounts which are attached directly to the front panel of the case. The case is made waterproof and airtight by ten attaching screws and a rubber sealing gasket located between the case flange and the front panel. A silica gel dehydrator within the case serves to absorb any moisture that may be present. Four connector receptacles are secured to the front panel and provide circuit continuity between components of the receiver and the target drone antenna, parachute solenoid, servo system, and power source. Access to the r-f tuning unit adjustment slug is obtained through the "TUNING ACCESS" aperture located on the front panel. All major components of the receiver are of the plug-in type and are mounted on a chassis assembly within the waterproof case. These components include all electron tubes, all relays, the r-f tuning unit and the synchronous vibrator. The r-f tuning unit consists essentially of an electron tube and associated circuitry, a tuning slug, and a connector plug. Components of the r-f tuning unit are housed on or within a rectangular metal chassis which

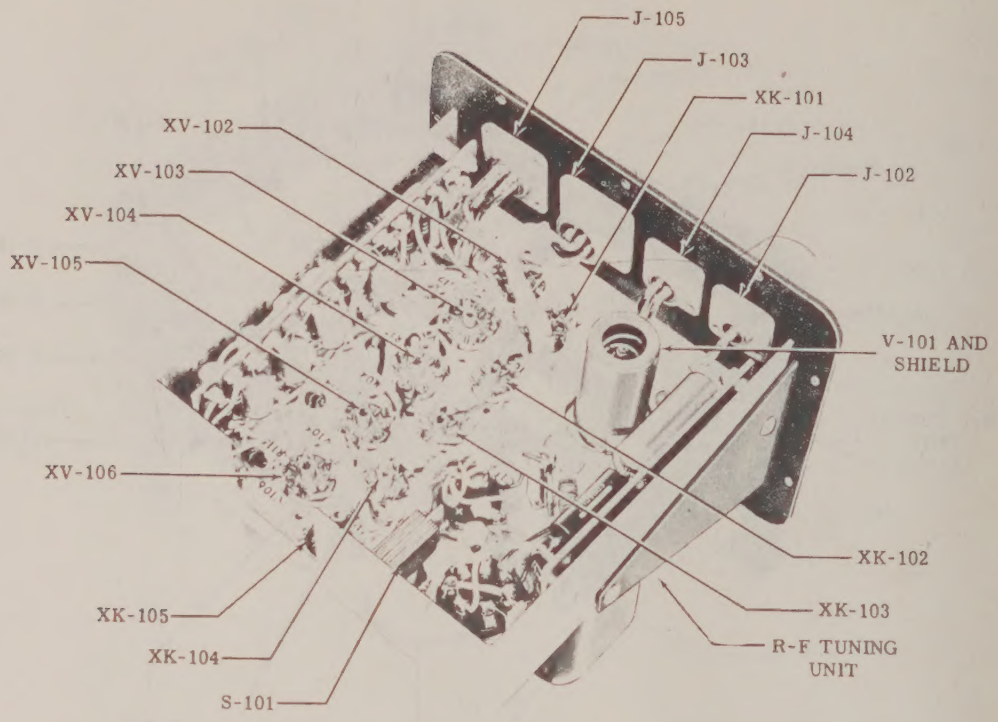

Figure 1-4. Radio Receiver-Selector R-196C/ARW-26Y, Bottom View of Chassis

is secured to the receiver chassis assembly by attaching screws.

1-13. ELECTRON TUBE COMPLEMENT.

1-14. JAN Type 12AU7 electron tubes are used throughout the receiver. A total of six such electron tubes are employed and the arrangement of five of the tubes on the chassis assembly top is shown in figures 1-2 and 1-3. The single r-f tuning unit electron tube V-101 and various other circuit components are shown in figures 1-4 and 1-5. Functions of the six electron tubes are as follows:

a. V-101A - Grounded grid r-f amplifier.
b. V-101B - Super-regenerative detector.
c. V-102A - First audio amplifier.
d. V-102B - Bias rectifier for relay control tubes.
e. V-103 - Second audio amplifier. Both triode sections connected in parallel.
f. V-104A - 300 cycle relay control tube.
g. V-104B - 650 cycle relay control tube.
h. V-105A - 1390 cycle relay control tube.
i. V-105B - 3000 cycle relay control tube.
j. V-106A - 955 cycle (parachute control) relay control tube.
k. V-106B - Delay and holding tube for parachute channel.

1-15. CHARACTERISTICS.

1-16. The applicable physical and electrical characteristics of the Radio Receiver-Selector R-196C/ARW-26Y and R-196D/ARW-26Y are tabulated in Table I.

TABLE I. EQUIPMENT CHARACTERISTICS

PHYSICAL CHARACTERISTICS	
Dimensions (overall)	Inches
Width	8-11/16
Height	5-5/8
Length	6-1/2
Total Weight	5.75 pounds

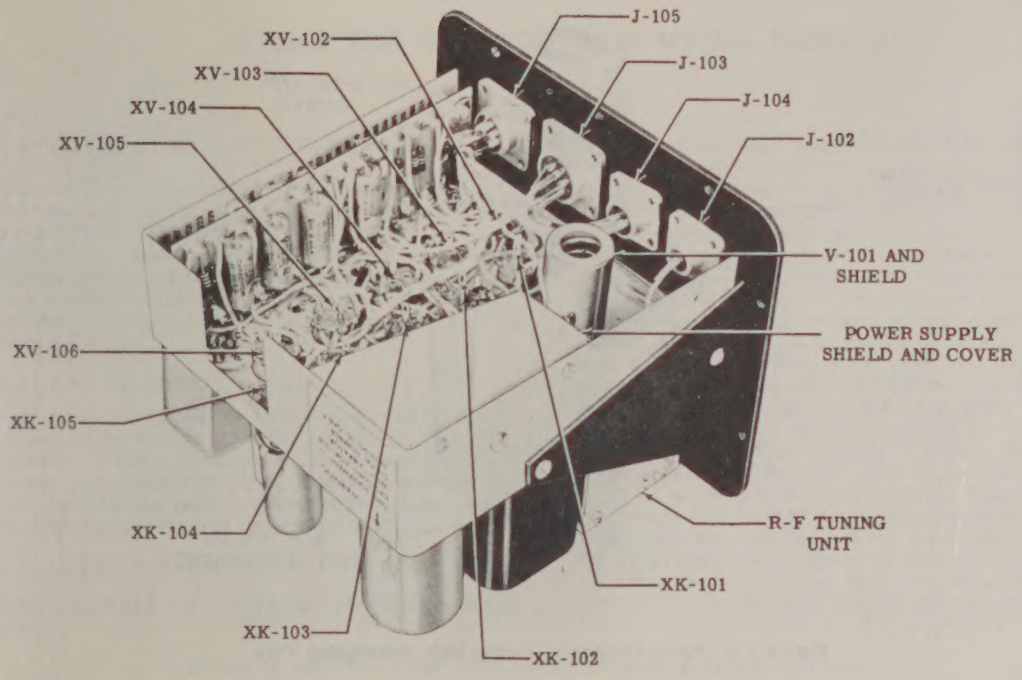

Figure 1-5. Radio Receiver-Selector R-196D/ARW-26Y, Bottom View of Chassis

TABLE I. EQUIPMENT CHARACTERISTICS (cont)

EQUIPMENT OPERATING RANGES	
Temperature	-25°C to +70°C (-13°F to +158°F)
Altitude	0 to 50,000 feet
FREQUENCY DATA	
R-F Tuning Range	57 to 74 megacycles
Preset Frequency	73 megacycles
Frequency Stability	0.25%
Sensitivity	10 microvolts
Selectivity	±1 megacycle
Band Width (r-f tuning unit)	2 megacycles at 20,000 microvolts, 75% modulation
SIGNAL CHARACTERISTICS	
Receiver Input	57 to 74 megacycle r-f signal, amplitude modulated by a-f signal of 300, 650, 1390, 3000 or 955 cycles per second
Input Impedance	62 ohms
Receiver Output	Mechanical closure of relays to provide a ground return for +26.5 volts dc to servo control mechanisms
POWER REQUIREMENTS	
Input Voltage	26.5 volts dc
Total Current Requirements at	
Rated Voltage	0.75 ampere
Heater	0.45 ampere
Power Supply	0.3 ampere
Total Normal Operating Current	0.75 ampere
Maximum Starting Current	1.1 amperes

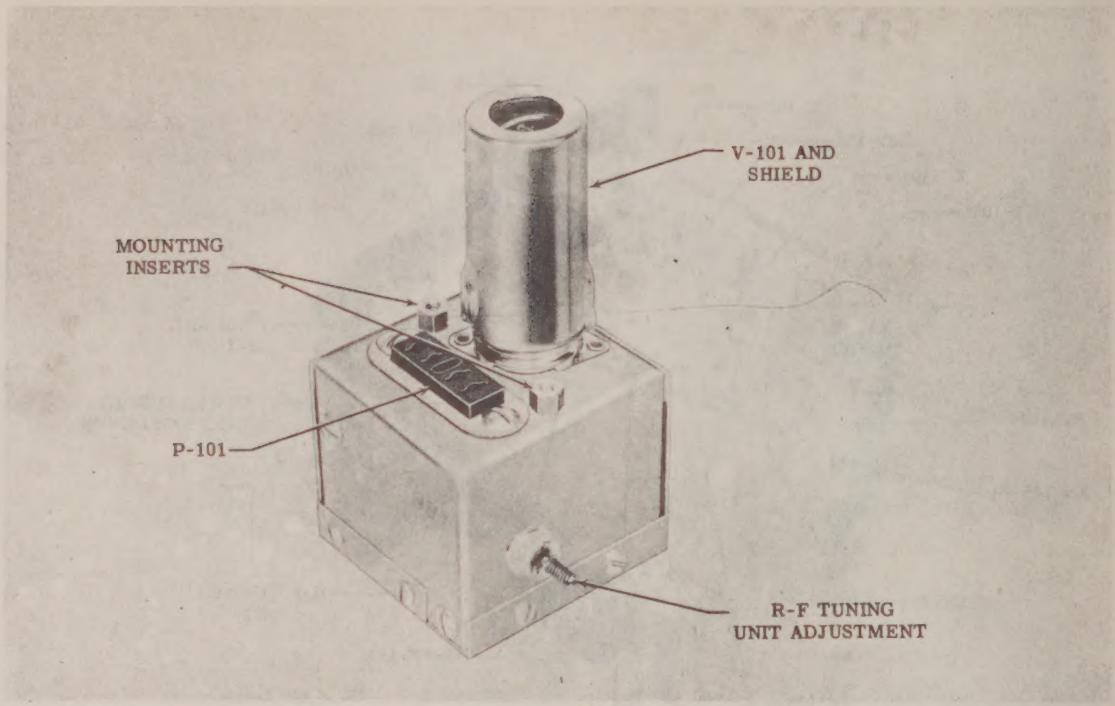

Figure 1-6. Radio Frequency Tuning Unit, Assembled View

SECTION II

SPECIAL TEST EQUIPMENT AND SPECIAL TOOLS

2-1. LIST OF SPECIAL TEST EQUIPMENT.

2-2. All items of special test equipment required to service and maintain the Radio Receiver-Selector R-196C/ARW-26Y and R-196D/ARW-26Y are tabulated in Table II. Information concerning test equipment nomenclature, type designations and application is also incorporated in Table II. The suggested alternate test set for receiver check and maintenance is shown in figure 2-5.

2-3. LIST OF SPECIAL TOOLS.

2-4. No special tools are required for service and maintenance of the R-196C/ARW-26Y or R-196D/ARW-26Y. However, common handtools such as screwdrivers of the proper size, needle nose pliers, diagonal cutters, miniature electron tube pullers, soldering irons, etc., should be available to properly service the units.

2-5. CABLE FABRICATION.

2-6. The Test Set TS-257/ARW is supplied with two interconnecting cables which are required during bench test of the R-196C/ARW-26Y or R-196D/ARW-26Y. Fabrication of two substitute cables will be necessary if length of the supplied cables is not suitable for maintenance activities. Figures 2-1 and 2-3 provide construction details of the two substitute cables required for use with the TS-257/ARW. The multiconductor cable shown in figure 2-1 and the two-conductor power cable shown in figure 2-3 are identical, except for length, with TS-257/ARW Cables, CX-1164/ARW and CX-1255/U respectively. Fabrication of two interconnecting cables will be required if the alternate Test Set shown in figure 2-5 is employed for bench test of the equipment. Figures 2-2 and 2-4 provide construction details of the two cables required for use with the alternate Test Set. The multiconductor cable and the power cable for use with the alternate Test Set are shown in figures 2-2 and 2-4 respectively. The r-f input cable required between the r-f signal generator and the receiver is provided with the r-f signal generator and does not require fabrication. All other interconnecting wires can be made from AN-J-C-48 wire, No. 16 size, cut to the required length.

TABLE II. SPECIAL TEST EQUIPMENT REQUIRED FOR MAINTENANCE

Figure No.	Name	Manufacturer's or AN. Type Designation	Alternate	Use
5-1	Signal Generator	TS-479/URR	Measurements Model 80	Supply r-f signal for alignment and check
5-1	Audio Oscillator	TS-382A/U	Hewlett Packard 200-C or 205-AG	A-f modulation of r-f signal
5-1	Test Set	TS-257/ARW	Test Set (see figure 2-5.)	Checking operation and alignment of receiver
	Oscilloscope	TS-239/UP	TS-34/AP, Dumont 241, Triumph 830	Signal tracing
5-1	Headset	HS-23 (high impedance)	HS-33 (low impedance)	Aural monitoring
	Adapter	MC-385-A	---	Impedance match for HS-33 Headset
	Multimeter (1000 ohms-per-volt)	TS-297/U	Simpson 433 or Weston 663	Voltage and resistance measurements
	Multimeter (20,000 ohms-per-volt	TS-352/U	Navy Model OE, Simpson 260	Voltage and resistance measurements
	Tube Tester	Signal Corps Type I-177A	Hickok 540 or 545	Test of electron tubes

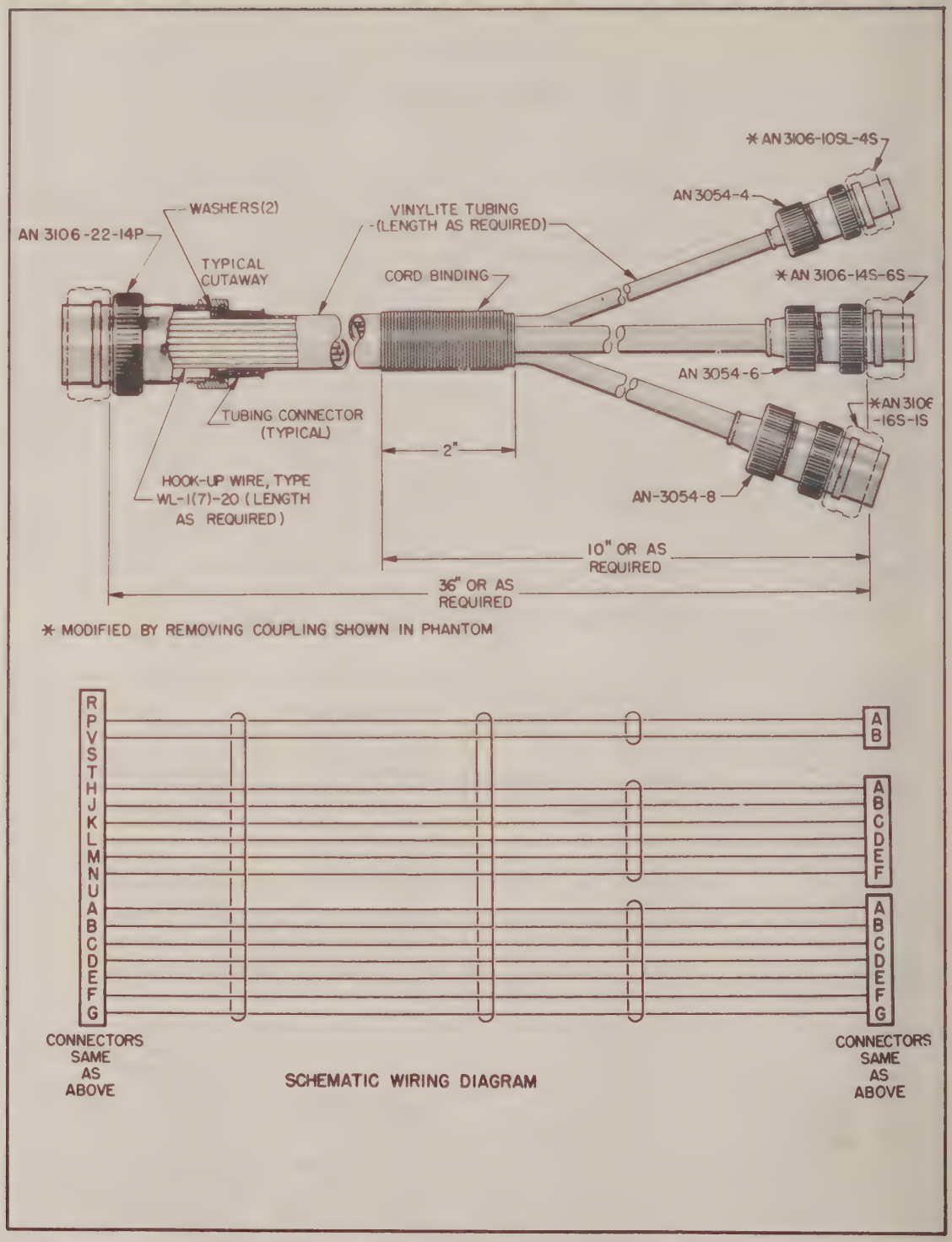

Figure 2-1. Substitute for Multiconductor Cable CX-1164/ARW, Fabrication Details

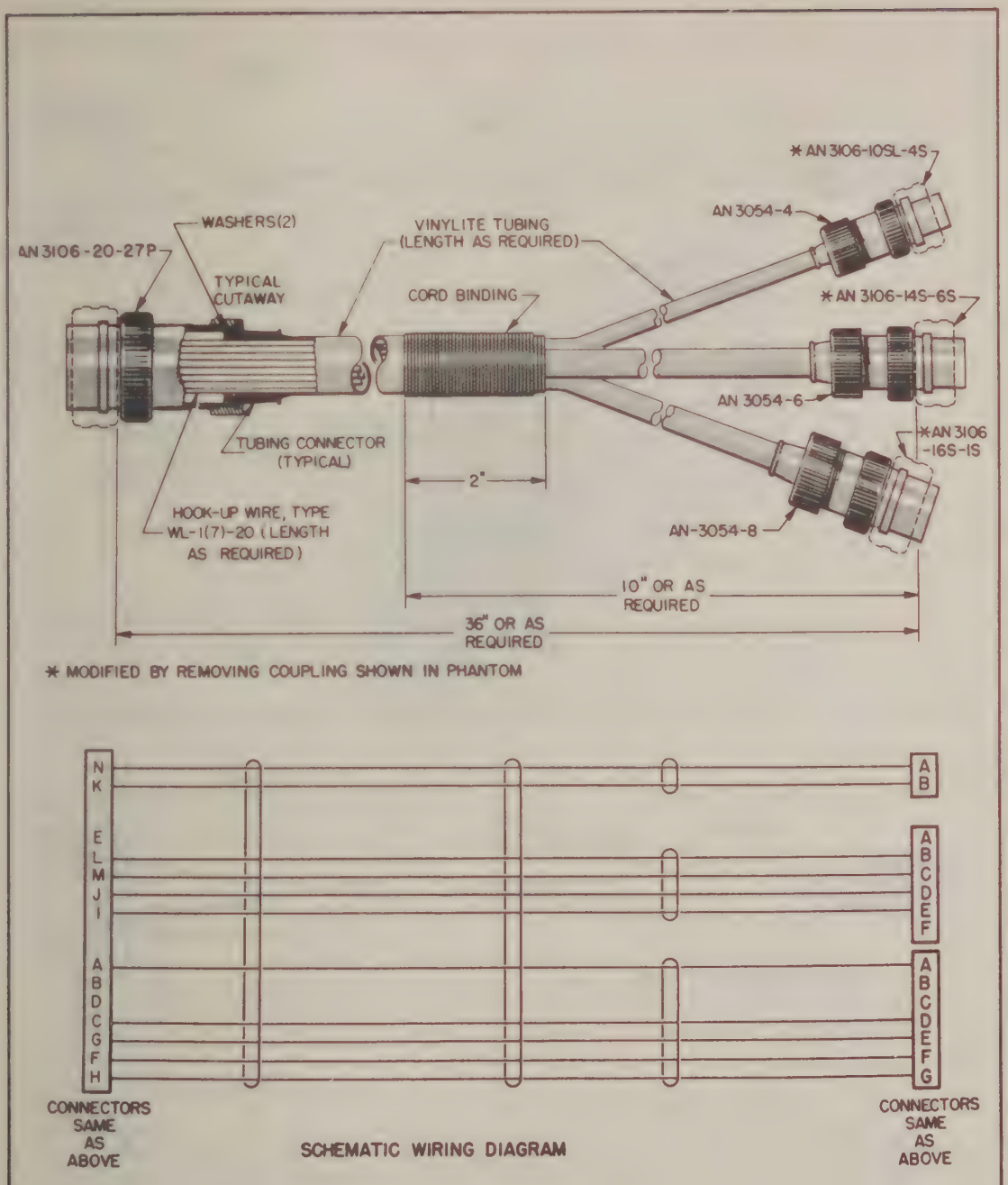

Figure 2-2. Multiconductor Cable for Use with Alternate Test Set, Fabrication Details

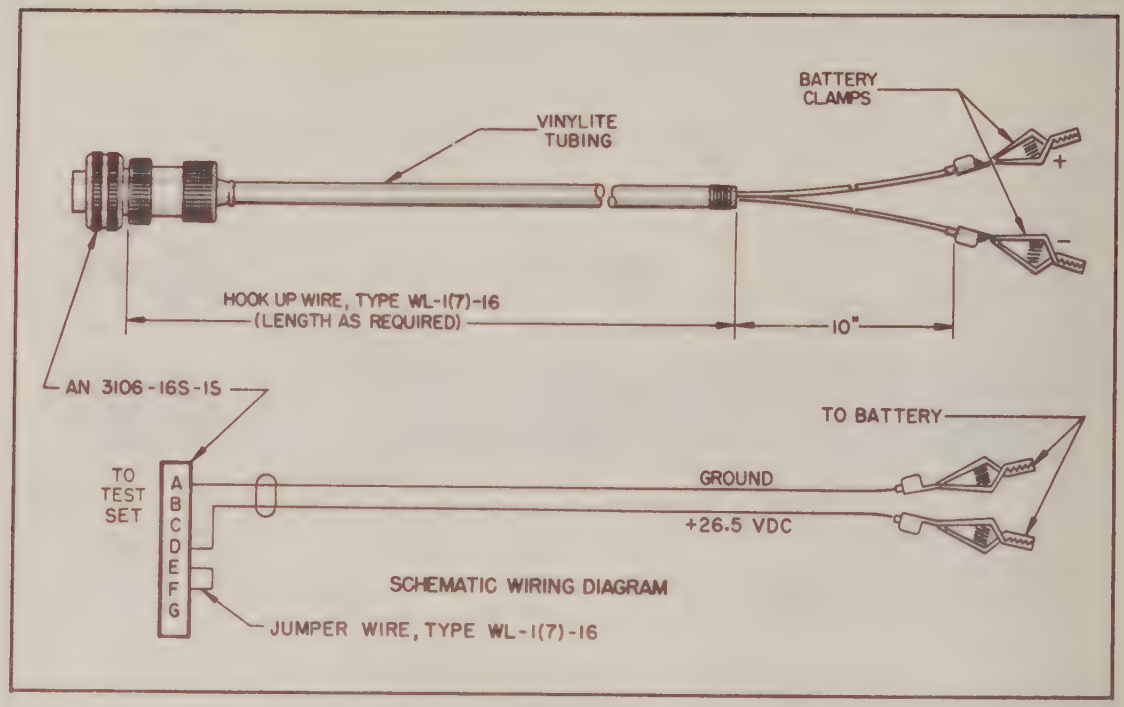

Figure 2-3. Substitute for Power Cable CX-1255/U, Fabrication Details

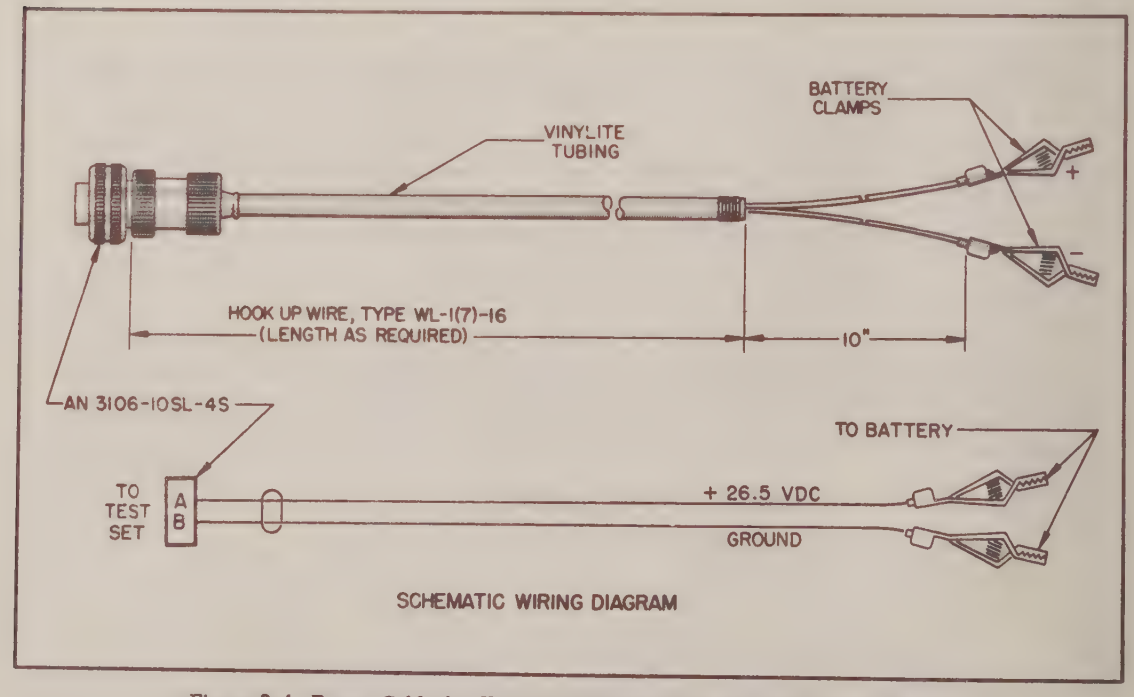

Figure 2-4. Power Cable for Use with Alternate Test Set, Fabrication Details

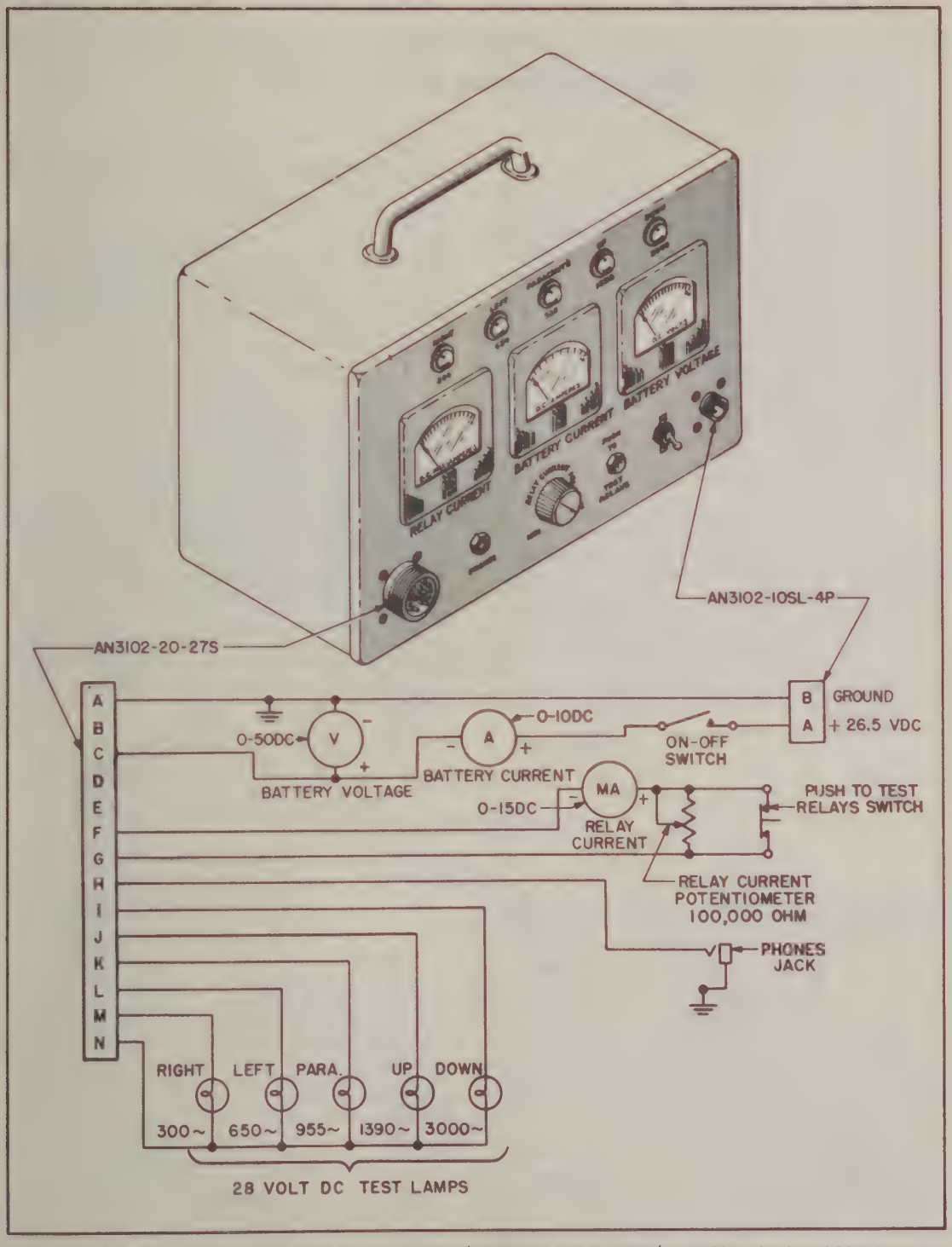

Figure 2-5. Suggested Alternate Test Set for R-196C/ARW-26Y and R-196D/ARW-26Y Check and Maintenance

SECTION III

PREPARATION FOR USE AND RESHIPMENT

3-1. GENERAL.

3-2. This section contains instructions for unpacking the Radio Receiver-Selector R-196C/ARW-26Y and R-196D/ARW-26Y. Also included is information necessary for inspection and check of the equipment to determine that it is functioning satisfactorily and prepared for installation within the target drone. The majority of units received by field maintenance activities will be installed within the target drone. However, some units may be packaged and shipped as separate components. Detailed instructions necessary for unpacking the units shipped as separate components are outlined in paragraph 3-4. The instructions outlined in paragraphs 3-5 through 3-8 apply to all R-196C/ARW-26Y and R-196D/ARW-26Y units, irrespective of the shipping method employed.

3-3. UNPACKING.

3-4. The subsequent instructions are applicable to R-196C/ARW-26Y or R-196D/ARW-26Y units packaged as displayed in figure 3-1. Remove the units from the packing case as follows:

a. Cut the metal straps which secure the packing case.

b. Employ a nail puller and remove the nails which secure the packing case lid. Carefully remove the lid.

c. Lift out the individual cardboard cartons which house the individual units.

d. Remove the paper tape and open the cardboard carton. Carefully remove the first layer of fiber batting.

e. Open the waterproof barrier if packed for export shipment. Remove the inside layer of fiber batting.

f. Carefully lift the unit from the carton and internal wrappings. Check the contents of the carton against the packing slips.

3-5. INSPECTION AND TEST.

3-6. The subsequent instructions are applicable to all receiver units whether packaged or installed within the target drone.

a. Disconnect the cables and remove the receiver if installed within the target drone. Inspect target drone cable connector plugs for evidence of damage such as bent or broken pins. Inspect cables for signs of damage and shock mounts for excursion and security of fastening.

b. Place the unit on a suitable work bench. Remove the ten attaching screws and waterproof case from the housing.

c. Visually inspect both the interior and exterior of the

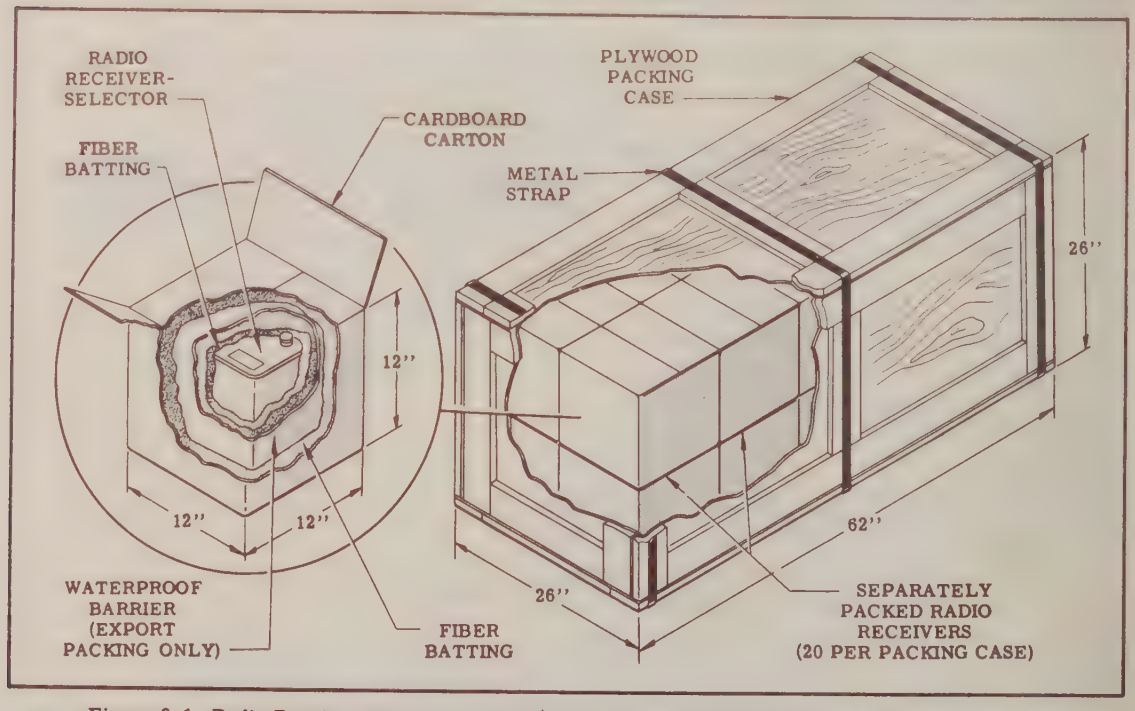

Figure 3-1. Radio Receiver-Selector R-196C/ARW-26Y and R-196D/ARW-26Y, Packing Diagram

unit for signs of damage to parts. Pay particular attention to the electron tubes and relays. It is recommended that the electron tubes be removed and checked on a suitable tube tester such as is tabulated in Table II. Substandard electron tubes must be discarded and replaced with electron tubes of known quality.

d. Check all plug-in parts such as electron tubes, relays, the r-f tuning unit and the vibrator for evidence of bent or broken contact pins.

e. Perform a visual check of unit wiring for signs of damaged, frayed, loose or burned wires. Check for tightness of mounting hardware and for corrosion of wiring terminals.

f. Connect the unit and test equipment as shown in figure 5-1 after completion of the visual inspection.

g. Check alignment or realign the r-f tuning unit to the desired reception frequency as outlined in paragraph 6-13.

h. Upon completion of the r-f tuning unit alignment, submit receiver to the minimum performance standards check outlined in Table III. This will insure that the receiver is operating properly and ready for installation.

i. Replace the case and cinch down on the ten attaching screws upon completion of the minimum performance standards check. Make certain that the protective cap is securely tightened in the "TUNING ACCESS" aperture.

j. Install the equipment within the target drone and make all necessary electrical connections. Check to insure that the target connector plugs are making full contact with the mating receiver connector receptacles.

k. Check shock mounts for security. Check security of snap-slide fasteners and safety wire if type FT-441-B shock mounts are employed. Check that mounts are rigidly secured to the front panel if the alternate mounts are employed. Make certain that shock mounts have full shock action and that they can move to the limit of their travel without binding or encountering obstructions.

l. Perform all necessary checks of the target drone as described in the Handbook of Operation Instructions for the target drone. Execute the required preflight test of the R-196C/ARW-26Y or R-196D/ARW-26Y as outlined in the applicable Handbook of Operation Instructions.

3-7. PREPARATION FOR STORAGE OR RESHIPMENT.

3-8. Proceed as outlined in the subsequent instructions if the equipment is to be stored for an extended period of time, or if it is necessary to reship the unit separately from the target drone.

a. Disconnect the electrical cables and remove the receiver from the target drone. Cover or store the target drone cable connector plugs so as to prevent damage to their contact pins.

b. Perform a visual inspection to determine that the case attaching screws and the "TUNING ACCESS" cap are tightened down.

c. Employ a carton and packing case of the type displayed in figure 3-1 and repack the receiver in the same manner as originally packed.

d. It is recommended that a bag of silica gel be placed within the cardboard carbon with the unit before the carton is sealed if the packing is intended for extended storage.

e. Reassemble the packing case components and fasten the case lid down tightly to prevent moisture from entering the case.

f. The receiver is now ready for reshipment or storage as desired. Store in a cool, dry place so that the unit will not be subjected to excessive heat or humidity. Air Force directives may dictate variations in electronic equipment storage methods and thus alter these instructions. However, maintenance personnel should adhere to the packing requirements herein unless definitely directed to do otherwise by higher authority.

SECTION IV

THEORY OF OPERATION

4-1. GENERAL SYSTEM OPERATION.

4-2. GENERAL.

4-3. The Radio Receiver-Selector R-196C/ARW-26Y and R-196D/ARW-26Y have an r-f tuning range of 57 to 74 megacycles and are designed to receive within this tuning range, r-f signals which are amplitude modulated by audio frequencies of 300, 650, 1390, 3000 and 955 cycles per second. Although all units are tuned to 73 megacycles when delivered from the factory, any desired reception frequency within the r-f tuning range can be selected by adjustment of the r-f tuning unit slug. One of five control relays within the unit will be actuated in response to amplitude modulation of the incoming r-f carrier by the corresponding one of the five specified audio frequencies. Actuation or closure of the relays provides flight control of the target drone and control of the target drone parachute. Four relays control the right, left, up and down movements of the target drone through related servo equipment. The fifth relay controls the target drone parachute through the parachute solenoid.

4-4. DETAILED. (See figure 4-1.)

4-5. R-f signals from the control transmitter are detected by the target drone antenna and are applied to the r-f tuning unit input through connector receptacle "J-102". The r-f voltage is amplified by V-101A and is delivered to the tuned input of V-101B. Audio frequency components present in the r-f carrier are detected due to the super-regenerative action of V-101B. The resultant a-f signals are successively amplified by V-102A and V-103, and are applied to the common input of the relay control stages. A portion of this a-f voltage passes through the bias rectifier V-102B and provides a bias voltage for the relay control tubes.

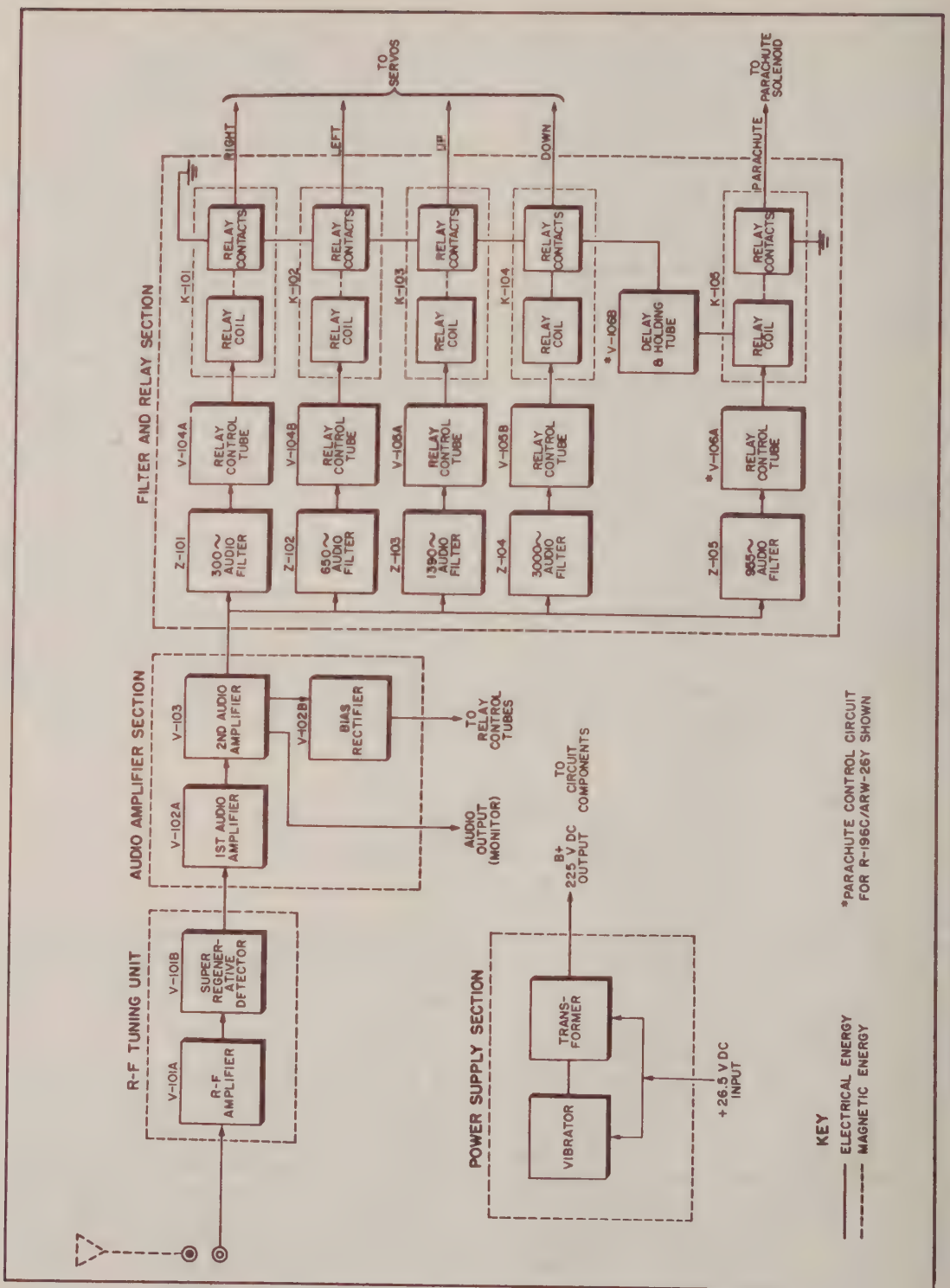

Figure 4-1. Radio Receiver-Selector R196C/ARW-26Y and R196D/ARW-26Y, Functional Block Diagram

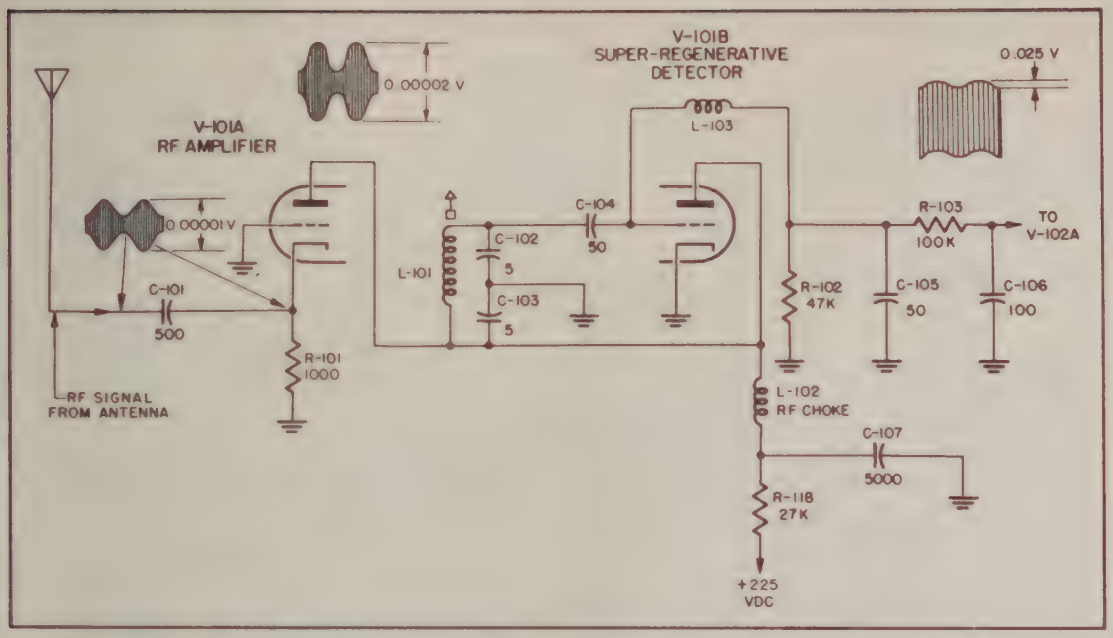

Figure 4-2. Radio Frequency Amplifier and Super-regenerative Detector, Simplified Schematic

4-6. Each audio filter is designed to pass a different one of the five a-f signals. The input of the five audio filters is common and the output of each filter is applied to the input of a separate relay control tube. A specific relay control tube will conduct and permit current flow when the a-f voltage applied through the related audio filter to the control tube grid equals or exceeds the blocking bias voltage. Current flows through both the relay control tube and the related relay coil when the relay control tube conducts and results in closure of the relay contacts. Closure of the relay contacts provides a 26.5 volts dc ground return for the servo system and permits the desired flight control of the target drone.

4-7. During normal flight operation, the r-f carrier is modulated continuously by the 955 cycle audio tone and thus maintains the parachute control relay K-105 in an energized condition to keep the target parachute hatch locked. The 955 cycle modulation is temporarily removed when any one of the other four flight command signals is given. Relay hold-in tube V-106 serves to hold the parachute control relay K-105 energized and prevents opening of the parachute hatch during the flight command signal interval. Relay K-105 contacts therefore remain closed at all times and the parachute solenoid is energized until either the 955 cycle a-f modulation is permanently removed from the r-f carrier, or until the control transmitter is turned off. The parachute solenoid becomes de-energized when either of these control actions is taken, or if the equipment should fail due to defective components or power loss. The target parachute is released and circuits within the target engine ignition system are opened when the parachute solenoid is de-energized.

4-8. The blocking bias developed by V-102B in response to an incoming a-f signal is applied to the control grids of the five relay control tubes. The grid voltage, developed in the control circuit which is tuned to pass the incoming signal, builds up sufficiently to overcome this grid bias and permits the operation of the specific relay. This blocking bias voltage is simultaneously applied to the grids of the remaining control tubes and serves to hold the tubes in a cut-off condition so that they will not operate in response to the incoming a-f signal. Bias voltage is proportional to the incoming a-f signal and is therefore an automatic function. The primary purpose of the bias voltage is to prevent mis-control of the target drone on take-off, and the secondary function is to provide high relay current under conditions of low signal strength.

4-9. FUNCTIONAL OPERATION OF ELECTRONIC COMPONENTS.

4-10. GENERAL.

4-11. The subsequent paragraphs provide essential information concerning each individual section or stage of the receiver. Information is discussed in order of signal sequence. Simplified schematic diagrams for individual sections and stages are furnished as an aid to understanding the information.

4-12. RADIO FREQUENCY AMPLIFIER. (See figure 4-2.)

4-13. The r-f signal detected by the target drone antenna is applied through receptacle "J-102" to the input of the r-f tuning unit. The r-f signal passes through coupling

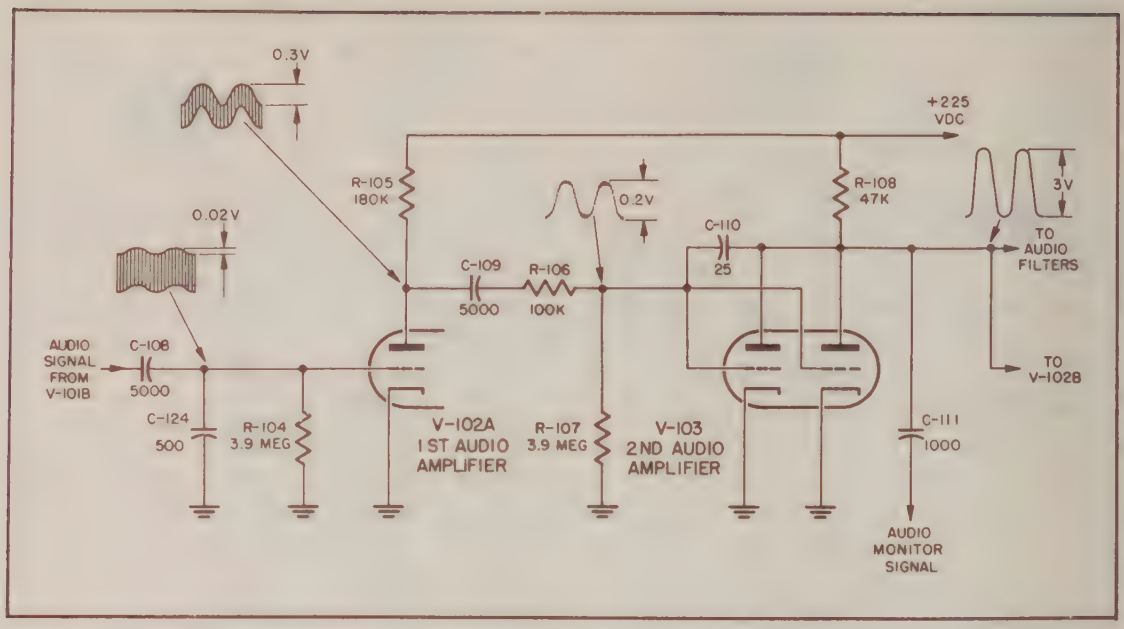

Figure 4-3. First and Second Audio Amplifier, Simplified Schematic

capacitor C-101 to the cathode of V-101A. Electron tube V-101A functions as a grounded-grid r-f amplifier and serves to amplify r-f signals applied to the cathode input. The amplified r-f signal that appears in the plate circuit of V-101A is applied to super-regenerative detector stage V-101B. Resistor R-101 serves as a ground return for the cathode of V-101A and functions to provide a fixed bias which is reflected onto the grounded grid of V-101A.

4-14. SUPER-REGENERATIVE DETECTOR. (See figure 4-2.)

4-15. The amplified r-f signals from electron tube V-101A are applied directly to the plate of V-101B. Electron tube V-101B and its associated circuit components are connected as a shunt-fed Colpitts oscillator circuit and function as a self-quenched, super-regenerative detector. Tuning of the oscillator circuit to the incoming r-f signal is accomplished by slug tuning of variable inductance L-101 which is combined with capacitors C-102 and C-103 to form a tuned oscillator circuit. The plate and control grid of V-101B are 180 degrees out of phase since they are connected to opposite ends of the tuned oscillator circuit consisting of L-101, C-102 and C-103. This condition provides the necessary feedback and produces the required quench signal. Detection of a-f components present in the incoming r-f signal is accomplished by grid leak detector action of resistor R-102 and capacitor C-104.

4-16. The quench frequency of approximately 22,000 cycles per second is determined by the RC values of resistor R-102 and C-104. This quench signal causes electron tube V-101B to go in and out of oscillation at a super-audible rate and produces tremendous amplification. Appropriate values of resistor R-102 and capacitor C-104 prevent the grid bias of electron tube V-101B from being affected by the incoming r-f signal.

4-17. The detected a-f signals appearing at the junction of R-103 and L-103 are passed through resistor R-103 to the control grid input of the first audio amplifier V-102A. Resistor R-103 and capacitor C-106 are connected to form a low pass filter whose function is to prevent the major part of the quench frequency from reaching the control grid of V-102A. Capacitor C-105 also aids in this filtering action. R-f choke L-102 serves to prevent the r-f signal from reaching the B+ power supply, L-103 serves to filter the high quench frequency component. Capacitor C-107 and resistor R-118 are connected to form a de-coupling network which provides additional r-f filtering action in the B+ plate circuits of V-101A and V-101B.

4-18. FIRST AUDIO AMPLIFIER. (See figure 4-3.)

4-19. The a-f signals detected by electron tube V-101B are applied through coupling capacitor C-108 to the input control grid of V-102A. Electron tube V-102A functions as the first audio amplifier and serves to amplify a-f signals impressed upon its grid. Capacitor C-124 between ground and the control grid of V-102A functions to bypass any r-f or quench frequency signals that may still be present at the input of V-102A. Resistor R-104 is also placed between these points and serves to provide a fixed bias relationship between the control grid and grounded cathode of electron tube V-102A. The B+ voltage for V-102A is dropped to a suitable potential by resistor R-105 which functions as a plate load resistor. The amplified a-f signals appearing on the plate output

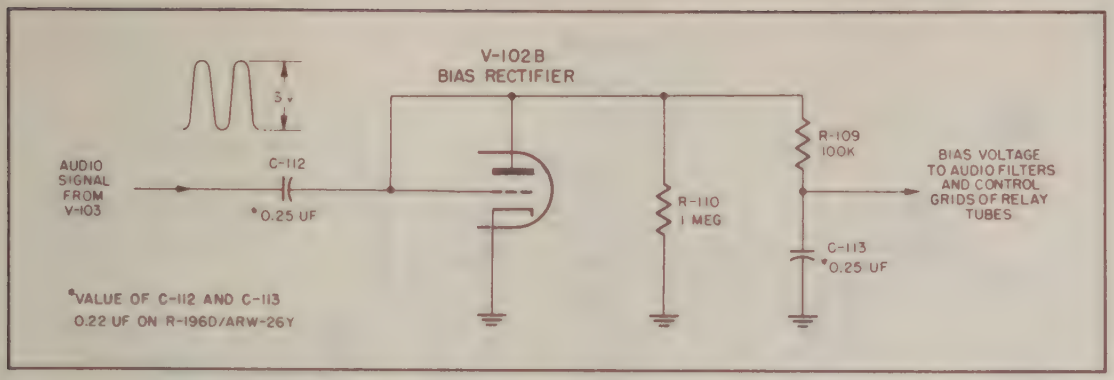

Figure 4-4. Bias Rectifier, Simplified Schematic

circuit of V-102A are passed through coupling capacitor C-109 and resistor R-106 to the input of V-103.

4-20. SECOND AUDIO AMPLIFIER. (See figure 4-3.)

4-21. The amplified a-f signals passed through coupling capacitor C-109 and R-106 are applied to the parallel connected control grids of V-103. The two triode sections of electron tube V-103 are connected in parallel and permit V-103 to function as a single triode power amplifier. Electron tube V-103 serves as the second audio amplifier and operates to amplify any a-f signals applied to its input grid. Resistor R-107 is placed between ground and the control grids of V-103 and functions to provide a fixed bias relationship between the parallel connected control grids and the grounded cathodes of V-103. The B+ voltage for both halves of V-103 is dropped to a suitable potential by resistor R-108 which functions as a plate load resistor.

4-22. Capacitor C-110 is connected between the parallel connected plates and control grid circuits of V-103 to provide an inverse feed-back condition. The values of capacitor C-110 and resistor R-106 are selected to provide maximum feed-back at frequencies above 6,000 cycles per second. Negligible effect is also provided at frequencies between 300 and 3,000 cycles per second. The purpose of the inverse feed-back voltage is to neutralize any 22,000 cycle quench frequency signal that may still be present at the control grid input of electron tube V-103.

4-23. The amplified a-f signals appearing in the parallel-connected plates of V-103 are delivered to the common input of the audio filter circuits in the audio filter and relay control stages of the receiver. A portion of these same a-f signals is applied to the input of bias rectifier V-102B. An a-f monitoring signal also derived from the parallel-connected plates of V-103 is passed through coupling capacitor C-111 to pin "G" of connector receptacle "J-103" on the front panel. This connection permits headphone monitoring of the a-f signals to determine that proper receiver operation is being obtained.

4-24. BIAS RECTIFIER. (See figure 4-4.)

4-25. The plate and control grid of electron tube V-102B are connected in parallel and permit V-102B to function as a single diode rectifier. The a-f signals derived from the output of V-103 are applied through coupling capacitor C-112 to the effective diode plate circuit of V-102B. Electron tube V-102B functions as a bias rectifier and serves to rectify the a-f signals impressed upon its effective plate circuit. The rectified bias voltage thus obtained appears across load resistor R-110 and is removed from the junction of resistor R-109 and capacitor C-113. This bias voltage is applied to the control grids of the five relay control tubes through their related audio filters. Any audio components in the bias voltage are bypassed to ground through capacitor C-113.

4-26. The bias voltage developed by electron tube V-102B is applied to the control grids of the five relay control tubes when any transmitted audio tone is detected by the receiver. The grid voltage developed in the specific relay control circuit which is tuned to pass the incoming a-f signal builds up sufficiently to overcome the bias voltage and permits operation of the corresponding relay. The bias voltage is simultaneously applied to the control grids of the remaining relay control tubes and serves to hold the tubes in a cut-off condition so that they will not conduct in response to the incoming a-f signal. Bias voltage is proportional to the strength of the incoming a-f signal and is therefore an automatic function. The primary purpose of the bias voltage is to prevent mis-control on take-off, and the secondary function is to provide high relay current under conditions of low signal strength.

4-27. AUDIO FILTERS. (See figure 4-5.)

4-28. A typical audio filter employed in the input circuit of each relay control stage is shown in figure 4-5. Each audio filter consists of a series resonant LC circuit and each filter is designed to pass a different one of the five specified a-f signals. Each relay control stage therefore responds only to the a-f signal to which its related audio filter is designed to pass. Good selectivity between a-f signals and high gain is obtained in the relay control stages due to the extreme high Q of these filters. The inputs of the five audio filters are

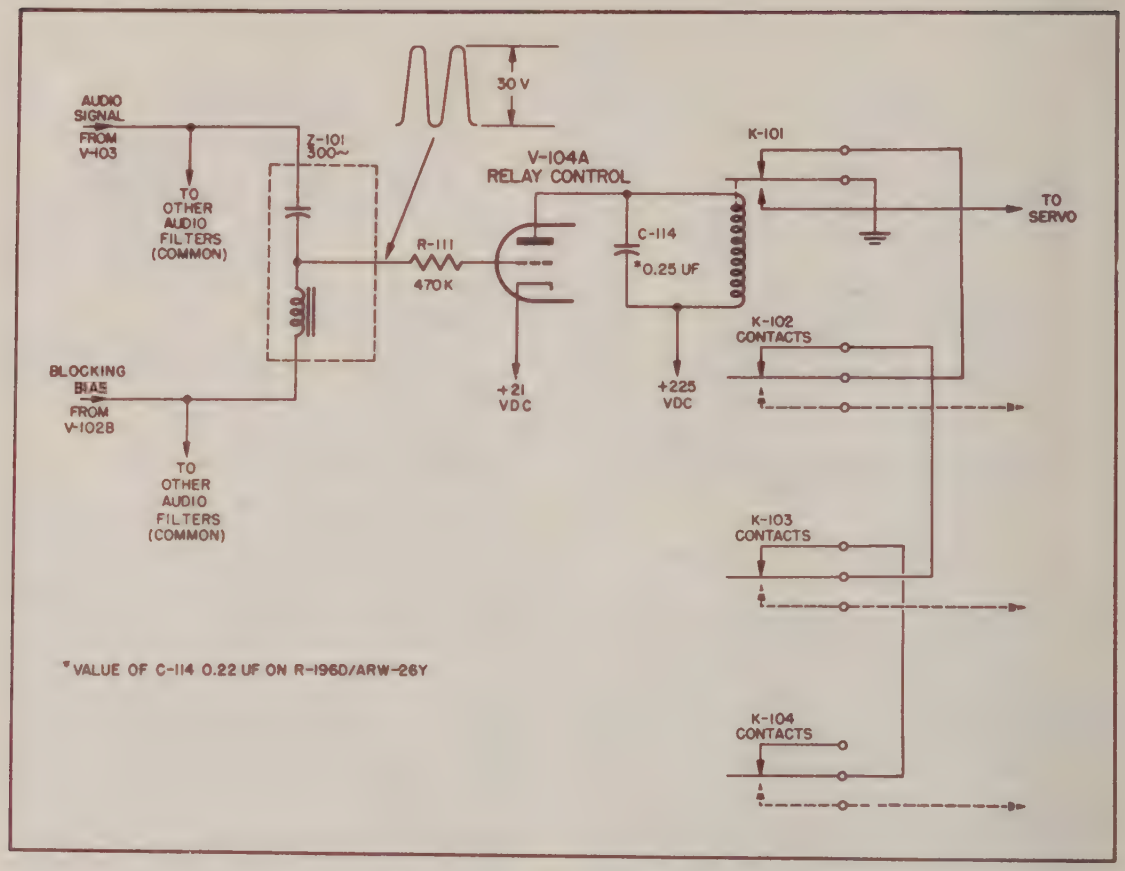

Figure 4-5. Audio Filter and Relay Control Stages, Simplified Schematic

connected in parallel and the output signals from each of the audio filters are applied through an isolating resistor to the control grid of the corresponding relay control tube. The bias voltage developed by electron tube V-102B is also applied through the audio filters to furnish the necessary control grid blocking bias to each of the relay control tubes.

4-29. RELAY CONTROL STAGES. (See figure 4-5.)

4-30. A typical relay control tube and associated circuitry is shown in figure 4-5. Each of the relay control tubes is biased to cut-off by the application of +21 volts dc to their cathodes. A specific relay control tube will conduct and permit current flow when the a-f voltage applied through the corresponding audio filter to the control tube grid equals or exceeds the combined bias voltage. Current flows through both the relay control tube and the related relay coil when the relay control tube conducts and results in closure of relay contacts. Closure of the relay contacts provides a 26.5 volts dc ground return for the servo system and permits desired flight control of the target drone.

4-31. One coil terminal of each of the control relays is connected to the B+ power source through pins "E" and "F" of "J-103". Under normal operating conditions, the plug which mates with receptacle "J-103" is wired with a special jumper between pins "E" and "F" to allow for B+ circuit continuity. Under test conditions, pins "E" and "F" of "J-103" are connected to a relay current indicating meter. This connection permits the current of the control relays to be measured externally. Capacitor C-114 is connected across the relay coil and serves to hold the relay coil energized during the negative half cycle of the incoming a-f signal.

4-32. PARACHUTE CONTROL AND RELAY HOLDING STAGES FOR R-196C/ARW-26Y. (See figure 4-6.)

4-33. The A section of electron tube V-106 and the related circuit components operate in a manner identical to that of the other four relay control stages. The B section of electron tube V-106 and the associated circuitry provide a holding and delay action during operation of the other four control stages and upon removal of all a-f signals. The 955 cycle parachute control signal passes through audio filter Z-105 and furnishes the required input signal to the A section of V-106. This control circuit operates in the same manner as

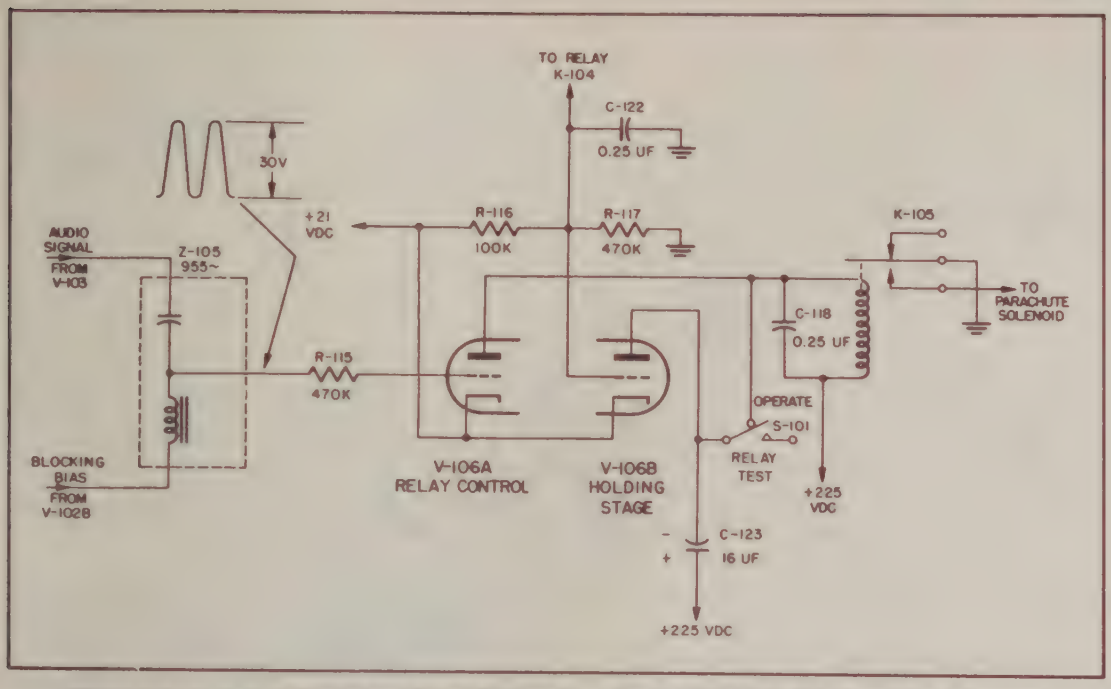

Figure 4-6. Parachute Control and Relay Holding Stage for R-196C/ARW-26Y, Simplified Schematic

described in paragraph 4-30 to provide actuation of the parachute control relay K-105 in response to the incoming signal. The parachute control relay K-105 will remain energized so long as a transmitted r-f carrier is being received and the 955 cycle a-f modulation is present.

4-34. The parachute relay and holding electron tube V-106B normally remains in a cut-off condition since its control grid is connected to ground through the contacts of the four control relays and since a bias voltage is developed across resistor R-116. Operation of relays K-101, K-102, K-103 or K-104 will remove the ground from the control grid and will allow the grid potential to be raised to the level that appears at the junction between resistors R-116 and R-117. This action decreases the effective bias on V-106B and permits current to flow through V-106B, the "RELAY TEST" switch S-101 and the parachute control relay K-105. The relay contacts close when current flows through the associated coil and provide a 26.5 volts dc ground return for the parachute solenoid. The target drone parachute hatch remains closed so long as the parachute solenoid remains energized. Capacitor C-123 functions to prevent relay K-105 contacts from opening during the momentary time interval which might occur between channel operation. Without this provision, relay K-105 would tend to open since the parachute control a-f signal is removed when any of the other channels are actuated. The "RELAY TEST" switch S-101 provides a method of de-energizing relay K-105 for purposes of measuring individual control relay currents. Capacitor C-122 prevents undesired operation of V-106B in the event of minor relay chatter.

4-35. Both the A and B sections of V-106 assume their normal cut-off condition and no plate current flows through the coil of K-105 when the 955 cycle a-f modulation is removed by actuation of the parachute release button on the transmitter control box or by permanent removal of the transmitted carrier. Capacitor C-123 discharges through the coil of K-105 and serves to hold K-105 contacts closed for an additional time interval of 1/2 to one second when either of these actions occur. This additional delay allows a given time to elapse before parachute release occurs and prevents such a release from being accomplished through an instantaneous loss of the transmitted carrier. Capacitor C-118 serves to hold the coil of relay K-105 energized during the negative half cycle of the 955 cycle a-f signal.

4-36. PARACHUTE CONTROL AND RELAY HOLDING STAGES FOR R-196D/ARW-26Y. (See figure 4-7.)

4-37. The overall function of the parachute control and relay holding stage for the R-196D/ARW-26Y is essentially the same as that for the R-196C/ARW-26Y. However, operation of the R-196D/ARW-26Y parachute control and relay holding stage is somewhat different. During normal flight operation when only the 955 cycle parachute control signal is received, the cathode of V-106A is returned to ground through resistor R-116 and the normally closed contacts of relays K-101, K-102, K-103 and K-104. V-106A functions as a cathode follower and serves to pass the 955 cycle signals from audio filter Z-105. The 955 cycle signals are applied to the

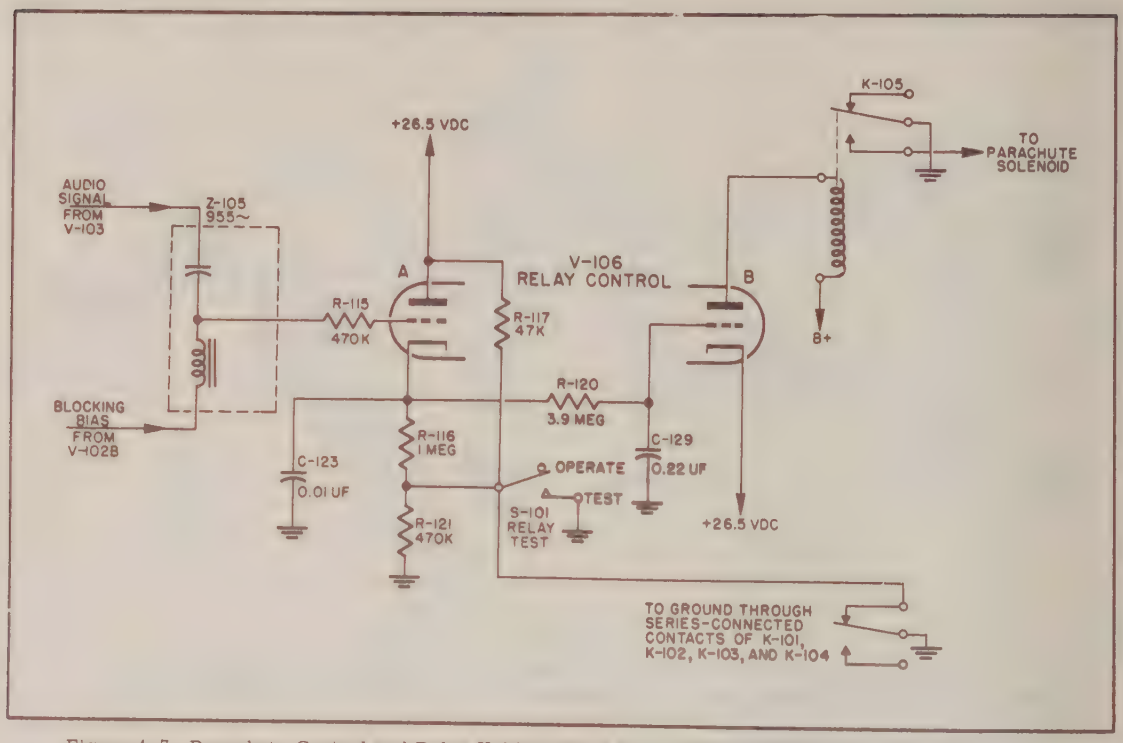

Figure 4-7. Parachute Control and Relay Holding Stage for R-196D/ARW-26Y, Simplified Schematic

grid of V-106A through isolating resistor R-116 and corresponding 955 cycle signals are developed across cathode load resistor R-116. These 955 cycle signals appear on the cathode of V-106A and are passed to the grid of V-106B through resistor R-120. The positive portion of the 955 cycle signals overcomes the fixed bias of +26.5 volts dc applied to the V-106B cathode and causes V-106B to conduct. Current flows through V-106B and the coil of relay K-105 when V-106B conducts and results in closure of K-105 contacts. Closure of K-105 contacts provides a ground return for the target parachute release mechanism and maintains the parachute hatch closed during normal flight operation.

4-38. During the command interval when any of the four command a-f signals are applied and the 955 cycle signal is temporarily removed, the ground return of R-116 is interrupted by the opening of K-101, K-102, K-103 or K-104 normally closed contacts. Under such conditions, a voltage divider network formed by resistors R-117 and R-121 is placed between the 26.5 volts dc line and ground. A fixed potential of approximately +23 volts dc appears at the junction of R-117 and R-121. This fixed potential is reflected onto the grid of V-106B through resistors R-116 and R-120, and causes V-106B to conduct. The contacts of relay K-105 close when V-106B conducts and the parachute hatch thus remains closed during the command interval. When all a-f signals are removed, either intentionally by actuation of the parachute release button or by failure of the equipment, the ground return for resistor R-116 is restored. However, since there are no 955 cycle signals applied, the +26.5 volts dc cathode bias of V-106B prevents V-106B from conducting. No current flows through the coil of K-105 and the contacts of K-105 remain open. The parachute release mechanism is thus de-energized and the parachute hatch opens to release the target parachute. Capacitors C-123 and C-129 are charged during the positive half of the 955 cycle signals and discharge to prevent V-106B from being cut off during the negative half cycle or during an instantaneous loss of the transmitted carrier. The "RELAY TEST" switch S-101 provides a method of de-energizing the relay K-105 when individual control relay currents are being measured during test.

4-39. POWER SUPPLY CIRCUIT FOR R-196C/ARW-26Y. (See figure 4-8.)

4-40. The R-196C/ARW-26Y power supply consists of power transformer T-101, synchronous vibrator CR-101, the necessary filter elements to provide a filtered B+ potential, and a "hash" suppression circuit. Application of the +26.5 volts dc power energizes vibrator CR-101 which supplies interrupted d-c voltage to the primary winding of transformer T-101. The high a-c voltage output of the T-101 secondary winding is then rectified by synchronous action of vibrator CR-101 to provide a B+ potential of approximately 225 volts dc at pin 5 of transformer T-101. Capacitors C-120 and C-121 serve as buffer capacitors across the secondary winding of T-101. The dual sections of capacitor C-126

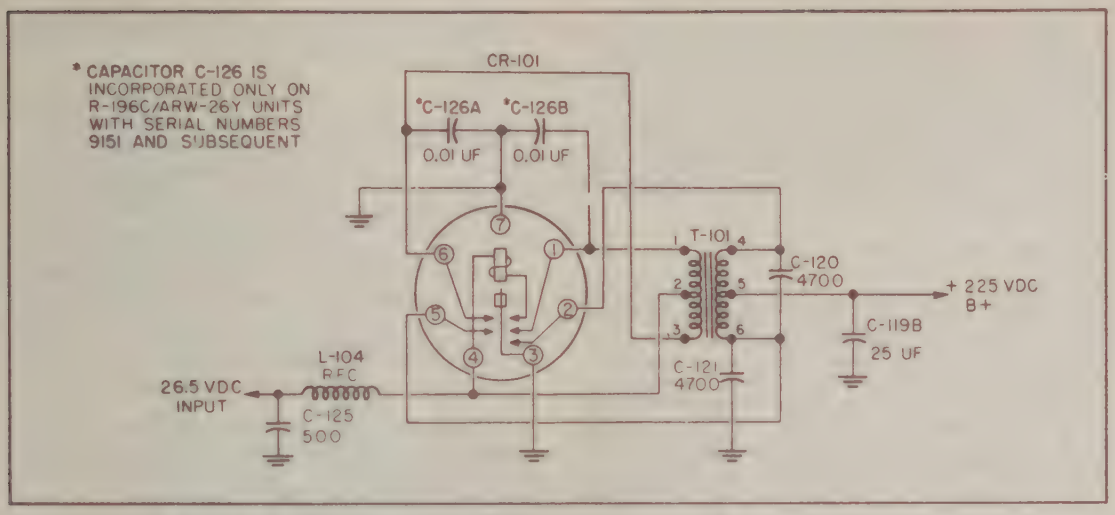

Figure 4-8. Power Supply Circuit for R-196C/ARW-26Y, Simplified Schematic

serve as buffer capacitors for the primary winding of T-101. Inductance L-104 and capacitor C-125 serve as an r-f filter network employed to confine and bypass the r-f "hash" generated by vibrator CR-101. Capacitor C-119B functions as an input capacitor for the B+ filter system.

NOTE

. Capacitor C-126 is incorporated only on R-196C/ARW-26Y units with serial numbers 9151 and subsequent.

4-41. POWER SUPPLY CIRCUIT FOR R-196D/ARW-26Y. (See figure 4-9.)

4-42. The R-196D/ARW-26Y power supply consists of a power transformer T-101, synchronous vibrator CR-101, the necessary filter elements to provide a filtered B+ potential, a "hash" suppression circuit, and a shielded case to house circuit elements. Application of the +26.5 volts dc power through feed-through capacitor C-122 energizes vibrator CR-101 which supplies interrupted d-c voltage to the primary winding of transformer T-101. The high a-c voltage output of the T-101 secondary winding is then rectified by synchronous action of vibrator CR-101 to provide a B+ potential of approximately

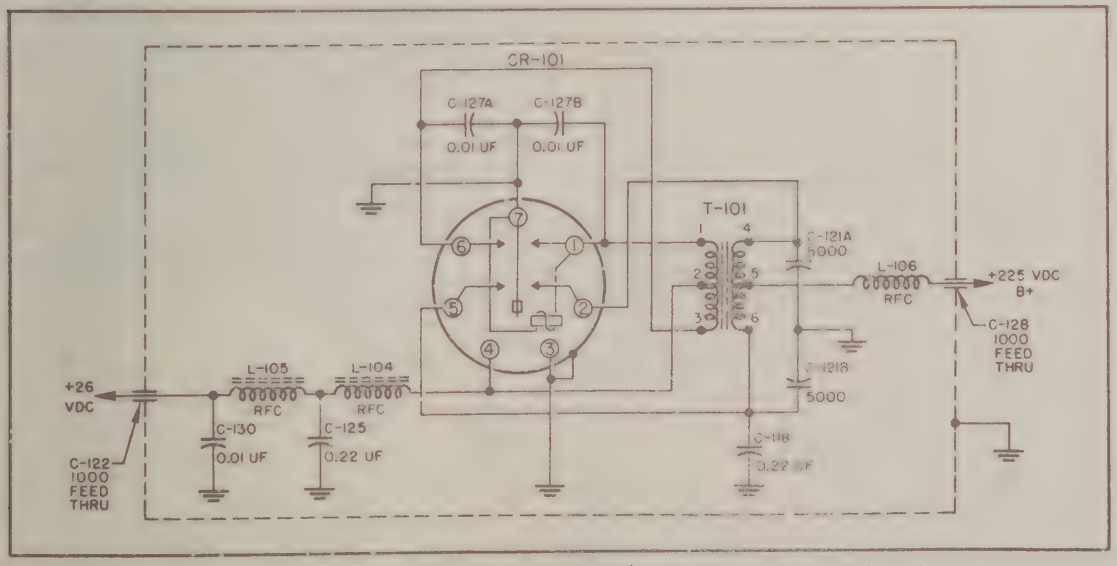

Figure 4-9. Power Supply Circuit for R-196D/ARW-26Y, Simplified Schematic

225 volts dc at pin 5 of transformer T-101. The dual sections of capaciotr C-121 serve as buffer capacitors across the secondary winding of T-101 and the dual sections of capacitor C-127 function as buffer capacitors for the primary winding of T-101. An r-f filter network employed to confine and bypass the r-f "hash" generated by vibrator CR-101 is formed by C-125, C-130, L-104 and L-105. Inductance L-106 functions to filter the B+ applied to circuit components through feed-through capacitor C-128.

4-43. HEATER CIRCUIT. (See figures 7-1 and 7-2.)

4-44. Heater connections for electron tubes employed in the R-196C/ARW-26Y and R-196D/ARW-26Y are shown on the master schematic diagrams, figures 7-1 and 7-2 respectively. The necessary heater potentials at required amperage to operate the electron tubes are derived through series-par connections. The heater center taps of electron tubes V-104, V-105 and V-106 on the R-196C/ARW-26Y, and V-104 and V-105 on the R-196D/ARW-26Y are connected to the cathodes of corresponding electron tubes and provide a fixed bias potential of approximately +21 volts dc.

4-45. FUNCTIONAL OPERATION OF MECHANICAL COMPONENTS.

4-46. The mechanical components of the subject equipment consist only of chassis, panels and attaching hardware. These components merit no special discussion concerning their operational function.

4-47. DETAILED SYSTEM OPERATION. (See figure 4-10.)

4-48. The subsequent paragraphs outline operational theory of a typical flight control system within which the subject equipment may be installed. It is assumed in this discussion that the receiver is to be employed as a control receiver-selector for radio controlled target drones.

4-49. By reference to figure 4-10 it will be seen that the receiver is installed within the target drone. Connections to the target drone antenna, 26.5 volts dc power source, target parachute solenoid and servo system are made through connector receptacles "J-102", "J-103", "J-104" and "J-105" respectively. During flight operation the target drone connector plug which mates with connector receptacle "J-103" is wired with a special jumper between pins "E" and "F" to permit B+ circuit continuity. The servo system controls both the elevator and aileron servos which drive their related surface controls. The ground control station consists essentially of the Radio Transmitting Set RC-56-A with a suitable control device, a power source and a transmitting antenna.

4-50. The r-f carrier output of the ground control transmitter is tuned to the preset reception frequency of the receiver and is capable of being amplitude modulated by one of the five control channel frequencies. The modulated r-f carrier signal is picked up by the target drone antenna and is applied to the receiver input. The a-f modulation component or control channel frequency is removed and is applied to the relay control stages within the receiver. The relay control stages serve to energize the appropriate control relay in response to the incoming signal and to close the relay contacts. Closure of the relay contacts provides a +26.5 volts dc ground return necessary for operation of the servo system and the parachute solenoid.

4-51. During normal operation the ground control transmitter r-f carrier output is continuously modulated by the parachute control or 955 cycle a-f tone until any of the other control channels are selected momentarily. Continuous modulation by the 955 cycle tone maintains the parachute control relay closed and provides a constant ground return to the parachute solenoid. The parachute solenoid will remain energized and will prevent the target drone parachute from being released so long as the ground return is maintained. The parachute control relay will become de-energized and will remove the ground return from the parachute solenoid, should the r-f carrier of 955 cycle a-f tone be removed, or should the receiver become inoperative for any reason. This action will permit the target drone parachute to be released, the target drone engine to be cut and will allow the target to be lowered to the ground. Time delay circuits incorporated within the receiver prevent this action from occurring as a result of instantaneous signal loss or by the momentary actuation of the other control channels.

4-52. Reception of any control channel signal operates the corresponding control relay. Reception of the 300 or 650 cycle channel results in the actuation of the right and left relays. These relays provide a ground return to that portion of the servo system which controls the target drone ailerons. Reception of the 1390 or 3000 cycle channels results in the operation of the up and down control relays. These relays provide a ground return to that portion of the servo system which controls the target drone elevators. The elevator and aileron servos control the movements of their related surface controls in response to orders received from the target control system and thus provide flight control of the target aircraft.

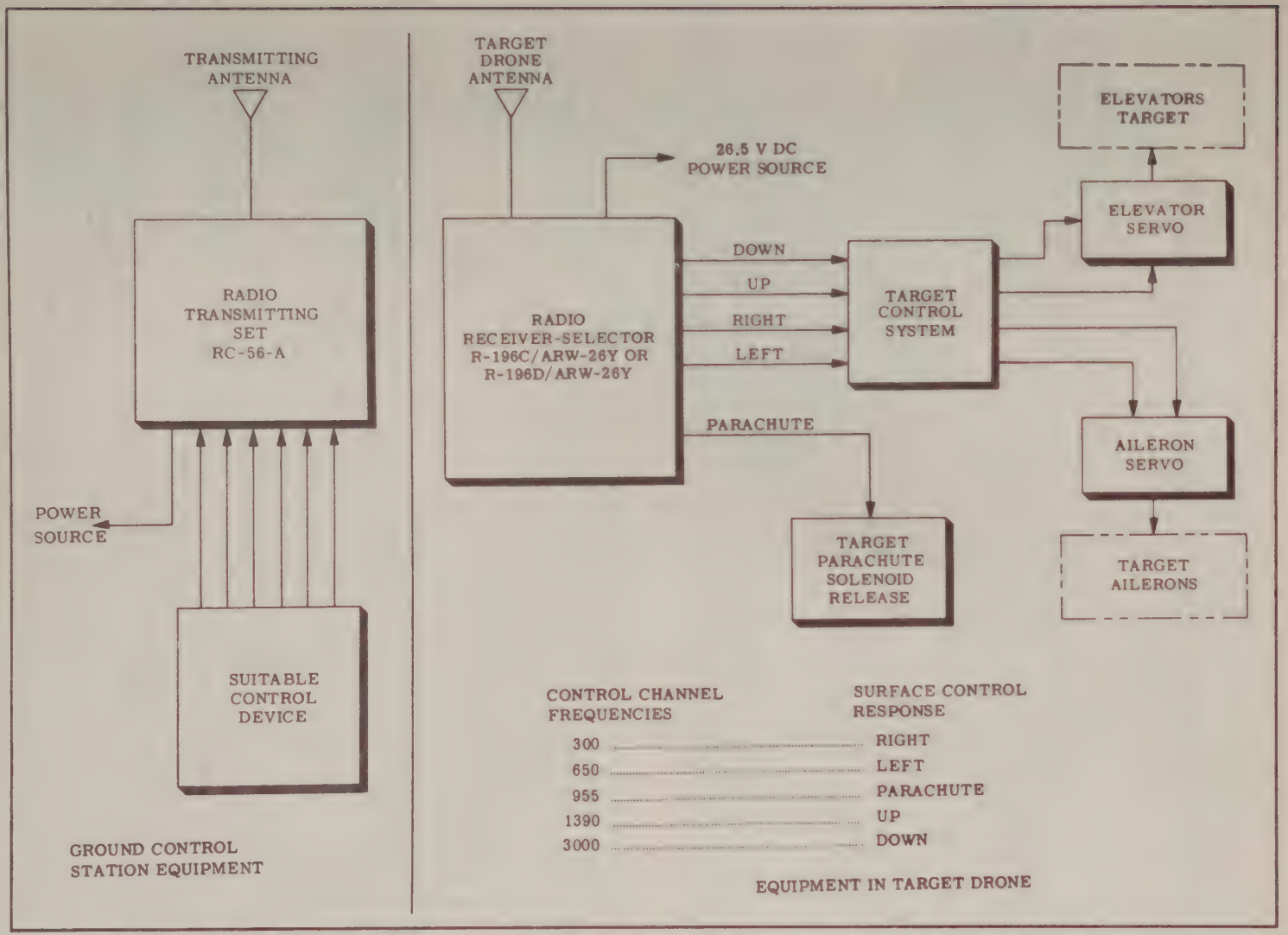

Figure 4-10. Radio Receiver-Selector R-196C/ARW-26Y and R-196D/ARW-26Y, Functional Block Diagram of System Operation

SECTION V

ORGANIZATIONAL AND OPERATIONAL MAINTENANCE

5-1. GENERAL.

5-2. This section includes performance standards and trouble analysis procedures which are provided to enable operational and organizational personnel to check the Radio Receiver-Selector R-196C/ARW-26Y and R-196D/ARW-26Y to determine that proper equipment performance is being obtained. It is assumed that maintenance personnel are thoroughly familiar with the physical characteristics of the subject equipment, the operational characteristics, capabilities and limitations, and that they have a basic understanding of the operational theory. This information is contained in Section I through Section IV of this publication and it is recommended that maintenance personnel study this information before attempting any maintenance procedures.

5-3. Instructions for performing such service and maintenance functions that may satisfactorily be accomplished by the using personnel are also provided. Repair instructions contained herein cover general procedures required to isolate the defect to a specific section of the receiver and which are within the capabilities of operating personnel having access to a minimum of test equipment. These instructions include the replacement of plug-in units such as electron tubes, control relay, synchronous vibrator and the r-f tuning unit. The receiver should be returned to the maintenance activity for further repair if the defect can not be located and remedied by the instructions provided in this section. Section VI of this publication includes a more comprehensive maintenance procedure for location and replacement of defective components.

5-4. MINIMUM PERFORMANCE STANDARDS.

5-5. The check chart found in Table III covers check procedures and includes information concerning minimum performance standards necessary to determine that the receiver is operating satisfactorily. The necessary suggested corrective measures should be undertaken as outlined in Table III or in the organizational and operational trouble analysis chart of Table IV if proper operation is not obtained. The receiver should be returned to the maintenance activity

TABLE III. MINIMUM PERFORMANCE STANDARDS CHECK CHART

Step	Procedure	Normal Indication	Corrective Measures
1	Tune r-f signal generator to 73 mc ± 0.05% (or other frequency to which receiver is aligned). Adjust for 200 microvolt signal input to test point (1) receptacle J-102.	--- ---	--- ---
2	Set audio oscillator to 955 cps ± 3%. Adjust output to provide 60% signal modulation.	If receiver is operating properly and is aligned to frequency of incoming signal, 955 cycle tone will be heard at test point (7), pin G of J-103 (monitoring headphones connect to this circuit). Parachute channel lamp on test set will glow.	Check alignment of receiver (paragraph 6-13). If no result, check for defective circuit (paragraph 6-7).
3	Tune r-f generator to provide signal 1-1/2 mc below alignment frequency. Repeat for frequency 1-1/2 mc above desired signal.	No tone should be heard in either position. Test lamp should not glow. Milliammeter reading should be less than 0.2 ma.	Receiver incorrectly aligned. Refer to paragraph 6-13.
4	Reduce input voltage to 22.5 volts. Maintain signal input of step 2.	Audio tone present in headset; parachute lamp should remain on.	Check for weak tube or defective circuit components.
5	Increase input voltage to 28 volts dc. Check relay current reading on test set milliammeter.	Should read approximately 6.5 ma. ("RELAY CURRENT" potentiometer on test set in "MAX." position).	Check relay and associated control tube.

TABLE III. MINIMUM PERFORMANCE STANDARDS CHECK CHART (cont)

Step	Procedure	Normal Indication	Corrective Measures
6	Turn "RELAY CURRENT" potentiometer counterclockwise from "MAX." position. Observe indicator lamp and milliammeter.	Lamp will extinguish as current decreases to relay drop-out point. This value should be more than 1.5 ma.	Replace relay.
7	Turn "RELAY CURRENT" potentiometer clockwise, observing indications.	Lamp will glow as relay pull-in current is reached (approximately 2.75 ma.	Replace relay.
8	Adjust audio oscillator to provide 300 cps signal.	300 cycle audio tone will be heard in monitoring headphones and related test lamp will glow. Parachute channel lamp will remain on.	Check for defective circuit. (Refer to paragraph 6-7.)
9	Depress "RELAY TEST" switch on chassis and check relay current on milliammeter ("RELAY CURRENT" potentiometer in "MAX." position).	Parachute lamp should extinguish and current on milliammeter should read approximately 6.5 ma.	Check relay and control tube.
10	Hold "RELAY TEST" switch down, check relay drop-out and pull-in currents as instructed in steps 6 and 7.	Indications should be same as steps 6 and 7.	---
11	Adjust audio oscillator to provide 650, 1390 and 3000 cps signals in turn. Check each channel as instructed in steps 6 through 9.	Same as steps 6 through 9.	---
12	Remove audio modulating signal, leaving r-f signal on.	Parachute channel lamp should extinguish after 1/2 to 1 second delay.	Check parachute control stage.
13	Remove r-f carrier signal. Check relay current.	Current reading should be less than 0.2 ma.	If excessive, replace vibrator.

for more extensive check and repair if the defect can not be corrected as outlined in Table III or Table IV. The following preliminary steps should be undertaken to insure that the test equipment and the receiver are properly interconnected and the required operating voltages are being supplied to the equipment.

a. Select a suitable work bench for check and repair of receiver. Unscrew and remove the ten attaching screws located on the front panel. Slide the case from the receiver and gain access to the "RELAY TEST" switch S-101. Remove and store the rubber sealing gasket and the ten attaching screws. It is recommended that the screws and gasket be stored within the removed case for safekeeping.

CAUTION

Exercise care to avoid damage to internal components of the equipment when removing or replacing the case.

b. Perform a visual check of the receiver interior for damage to parts. Pay particular attention to electron tubes, relays and all plug-in components. Inspect plug-in units for evidence of bent or broken pins. Proceed with the performance check when satisfied that no damage exists.

c. Connect the output of audio oscillator to external modulation terminals of the r-f signal generator. (See figure 5-1.) Employ two AN-J-C-48 wires or supplied cable. Connect output of the r-f signal generator to antenna receptacle "J-102" by means of the output cable supplied with the r-f signal generator.

d. A TS-257/ARW Test Set is recommended to check the receiver. An alternate test set may be constructed as shown in figure 2-5 if the TS-257/ARW is not available to maintenance activities. The TS-257/ARW is supplied with two interconnecting cables which may be employed during bench test. Figures 2-1 and 2-3 provide construction details of two substitute cables which may be used if the supplied cables are not of suitable length. Figures 2-2 and 2-4 provide construction details of two interconnecting cables required for use with the

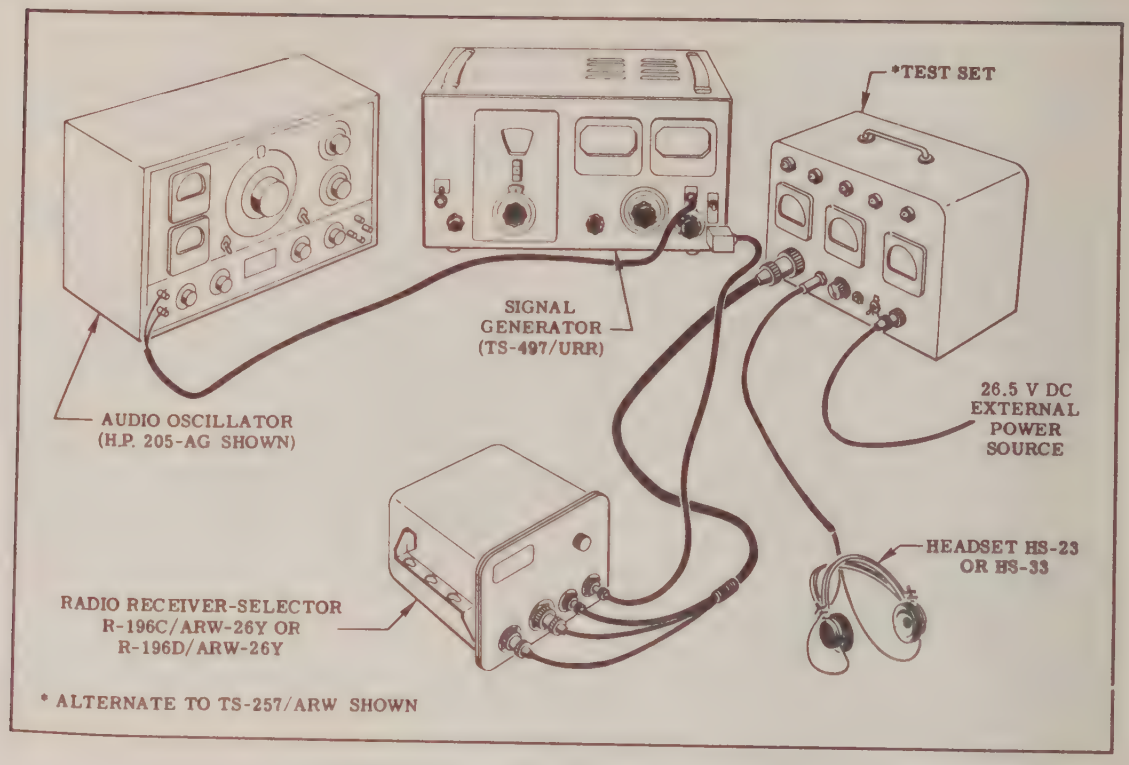
*TEST SET
SIGNAL GENERATOR (TS-497/URR)
AUDIO OSCILLATOR (H.P. 205-AG SHOWN)
26.5 V DC EXTERNAL POWER SOURCE
HEADSET HS-23 OR HS-33
RADIO RECEIVER-SELECTOR R-196C/ARW-26Y OR R-196D/ARW-26Y
* ALTERNATE TO TS-257/ARW SHOWN

Figure 5-1. Bench Test Connection Diagram

alternate test set. The subsequent check procedures are applicable whether the TS-257/ARW or the alternate test set is employed.

e. Connect the multiconductor cable between the test set and connector receptacles "J-103", "J-104" and "J-105" on the R-196C/ARW-26Y front panel. Insert Type HS-23 or HS-33 Headset into the audio jack on the test set. An adapter MC-385-A will be required if the HS-33 headset is employed.

f. Apply +26.5 volts dc to pin "D" of receptacle "J-103" by positioning the power switch on the test set to "ON". Allow at least one minute for receiver components to stabilize before attempting to check operation.

g. Check the d-c voltmeter on the test set to ascertain that input voltage to the receiver is 26.5 volts dc.

h. Proceed with the minimum performance standards check as outlined in Table III after the circuit components have attained a stable operating temperature.

5-6. SYSTEM (TROUBLE) ANALYSIS.

5-7. A step-by-step procedure which will enable operating personnel to perform a systematic check of an inoperative unit and to isolate the defect to the inoperative stage or section is provided in Table IV. The suspected defective component can be tested and replaced as necessary once it is isolated. This section of the handbook provides instructions for location and replacement of only such defective items of plug-in nature as electron tubes and relays which do not require servicing. More detailed instructions for localizing and repairing defective circuit components are provided in Section VI of this publication. The instructions contained within Table IV are based on the assumption that the receiver has failed to meet the minimum performance standards check outlined in Table III. The defective unit should be returned to a maintenance activity equipped to perform the more detailed and extensive operations described in Section VI when the defects can not be located and repaired by use of the information outlined in Table IV. Prepare the equipment for test as described in paragraph 5-5 before attempting trouble analysis and repair procedures.

5-8. REMOVAL.

5-9. The subsequent paragraphs outline the procedures for removal and replacement of plug-in components. It is assumed that the receiver is placed on a suitable work bench, that the ten attaching screws and case have been removed, and that adequate handtools are available for use.

5-10. REMOVING AND REPLACING THE R-F TUNING UNIT. (See figure 5-2.) The r-f tuning unit can be removed and replaced if it is suspected of being inoperative or malfunctioning. Remove the two attaching screws through the bottom of the chassis and carefully lift the r-f tuning unit from the chassis top. In-

TABLE IV. OPERATIONAL AND ORGANIZATIONAL TROUBLE ANALYSIS CHART

Step	Test Points	Test Equipment Conditions	Test Procedure	Normal Indication	Actual Indication	Possible Cause of Trouble	Recommended Corrective Action
1		Receiver energized--no input signal applied. 26.5 V dc input.	Observe test box for possible indications.	Vibrator hash 0.2; no aural or visual indications except hiss of detector in headphones.	Normal	---	Continue checks.
					Parachute test lamp illuminates.	V-102B, K-101, K-102, K-103, K-104, K-105 or V-106 defective.	Check associated components; replace as necessary.
					Other channel lamps illuminate.	V-102B, relay, or control tube in related circuit defective.	
2	①, Antenna receptacle J-102; ②, pin B of J-104.	Adjust audio oscillator for 955 cps modulating signal at 60% modulation. Apply 10 microvolt r-f signal at alignment frequency to test point. 26.5 V dc input.	Check for aural signal and operation of test set indicating lamp.	955 cycle tone heard in headset; parachute channel lamp illuminates.	Normal	---	Check for correct operation of other channels, step 6.
					955 cycle tone heard; no test lamp indication.	V-102B, V-106,or K-105 defective.	Check items; replace defective part.
						Circuit component defective.	Refer to Section VI, paragraph 6-7.
					No indication.	Receiver incorrectly aligned.	Realign as instructed in paragraph 6-13.
						Weak or defective component.	Continue checks.
3	① and ②	Increase r-f input signal strength to 100 microvolts.	Check for response in monitoring headset and test set.	Same as step 2.	Normal	---	Continue checks.
					Weak audio signal or no response.	V-101, V-102, or V-103 weak; receiver misaligned.	Check and replace tube. Realign if necessary.
						Misalignment or defective part.	Continue checks.
4	① and ②	Same as step 2.	Vary r-f signal input frequency slowly between 55 and 75 mcs; check for receiver alignment at other frequency.	Aural and visual response occur when r-f generator frequency matches that of receiver.	Indications occur at other than desired frequency.	Receiver aligned to incorrect frequency.	Realign to desired frequency.
					Weak signal or no response.	Defective component.	Continue checks.

TABLE IV. OPERATIONAL AND ORGANIZATIONAL TROUBLE ANALYSIS CHART (cont)

Step	Test Points	Test Equipment Conditions	Test Procedure	Normal Indication	Actual Indication	Possible Cause of Trouble	Recommended Corrective Action
5	(8), Pin E of J-103.	Use 300 V dc scale of multimeter.	Check for B+ voltage between test point and ground.	Approximately +225 V dc.	Normal	---	Continue checks.
					Low or no voltage.	CR-101 defective.	Test and replace.
						Short in B+ circuit.	Refer to Section VI, paragraph 6-7.
6	(1), (3), (4), (5), (6), pins C, B, D and E of J-105.	Apply 10 microvolt input signal at proper r-f frequency. Modulate 60% with a-f signals of 300, 650, 1390 and 3000 cps in turn.	Check aural and test lamp indications for each channel.	Corresponding audio signal should be heard; related test lamp should illuminate; parachute channel lamp should remain on.	Normal	---	---
					Aural signal present; test channel lamp not on.	V-102B, relay, or control tube in specific circuit defective.	Check and replace defective parts.
					No indication.	V-101, V-102, or V-103 defective.	
					Parachute lamp extinguishes.	V-106, K-105, or test channel relay defective.	
7	(1) & (9), Pin 4 of J-101.	Same as step 3. Ground one lead of monitoring headset to chassis. Connect second lead to test point (9) through 0.05 uf capacitor.	Check for presence of aural signal in headset.	Weak 955 cycle tone in headset.	Signal present.	---	Continue checks.
					No aural signal.	V-101 defective. tive.	Test tube. Replace if inoperative.
						V-101 defective.	
						Radio frequency tuning unit defective.	Replace tuning unit. Refer to paragraph 5-13.)
8	(1) and (2).	Same as 2.	Turn off r-f signal generator. Observe parachute test lamp.	Test lamp should remain on for 1/2 to one second after signal is removed.	Time lag is present.	---	---
					No time lag.	Time delay circuit components defective.	Refer to Section VI, paragraph 6-7.

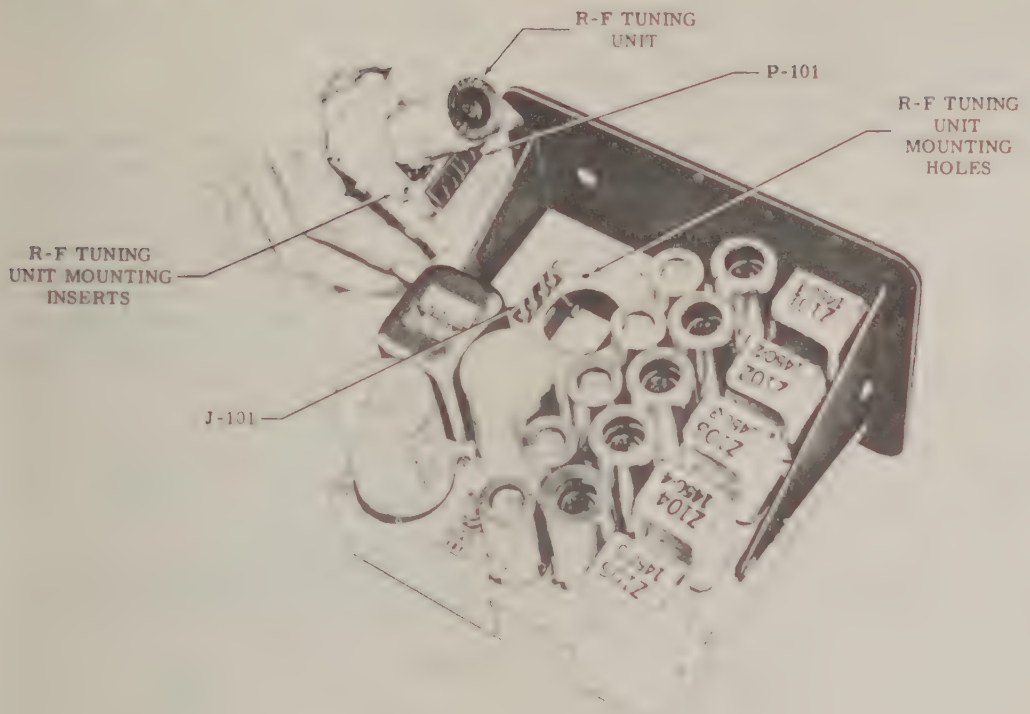

Figure 5-2. Removing and Replacing Radio Frequency Tuning Unit

stallation of a new r-f tuning unit can be effected by reversing this procedure. Exercise caution when passing the r-f tuning unit electron tube V-101 through the chassis aperture. The new r-f tuning unit must be realigned after it is installed within the receiver. Refer to paragraph 6-13 for realignment procedure. Removal and replacement of r-f tuning unit is not recommended until after the electron tube V-101 has been tested and found to be good or until it has been replaced with an electron tube known to be functioning satisfactorily. Replacement of the r-f tuning unit is warranted if it fails to perform properly after a known good electron tube V-101 is installed.

5-11. REMOVING AND REPLACING THE VIBRATOR. This unit is of the plug-in type and can be removed or replaced simply by pulling upward on the vibrator while holding the chassis. Be careful to match the keyway and contact pins of the vibrator and socket when reinstalling. The condition of the power supply circuit should be checked before reinstalling a new vibrator if a defect or short is suspected in the B+ circuit. Remove power from the equipment and check the resistance between test point (8) pin "E" of "J-103" and ground. Employ an ohmmeter of the type tabulated in Table II and use high resistance scale. The indicated resistance should be approximately one to ten megohms. A low resistance denotes a defect or short in the B+ circuit. Return the unit to the maintenance activity for further check if such a condition occurs.

5-12. REMOVING AND REPLACING ELECTRON TUBES. Electron tubes should be removed and tested with a suitable tube tester such as is tabulated in Table II if they are suspected of being defective. The electron tubes may be tested by the substitution method if an adequate tube tester is not available. A suspected defective electron tube can be replaced with one which is known to be functioning satisfactorily. A test of equipment operation as described in Table III will reveal if the trouble has been remedied. Employ a miniature electron tube puller when removing or replacing electron tubes. Exercise caution so as not to bend or damage the delicate contact pins on the electron tube base. Make certain to replace the electron tube shield.

5-13. REMOVING AND REPLACING RELAYS. All relays should be checked by the substitution method as previously outlined. The relays should be handled and extracted by the use of an electron tube puller as in the case of electron tubes. Make certain to replace the relay shields.

5-14. MINOR REPAIR AND ADJUSTMENT.

5-15. Repairs which can be effected by operating personnel are limited to the removal and replacement of plug-in units. Procedures for the removal and replacement of such components are outlined in paragraphs 5-8 through 5-13. The r-f tuning unit is the only component of the receiver that requires adjustment. The procedure for this adjustment is described in paragraph 6-13.

5-16. LUBRICATION.

5-17. No lubrication is required for any part of the equipment.

5-18. INSPECTION SCHEDULE.

5-19. A tabulation of recommended inspection procedures and the recommended time interval at which the inspections should be performed is contained in Table V. The inspection procedures consist essentially of a visual examination of mechanical and electrical components.

5-20. BENCH TEST SET-UP.

5-21. Figure 5-1 illustrates the recommended bench test set-up for the equipment. Cording and cabling details for the multiconductor cable and the power cable are shown in figures 2-1, 2-2, 2-3 and 2-4. Figures 2-1 and 2-3 display the details for substitute cables required with the TS-257/ARW Test Set and may be employed if it is not desired to use the supplied cables. Figures 2-2 and 2-4 display the details for cables required with the alternate test set shown in figure 2-5. All remaining cables are supplied with their related units or are not of sufficient complexity to merit discussion.

TABLE V. INSPECTION SCHEDULE

Component	Inspection	Time
Receiver Case	Security of panel attaching screws	10 hours
	Mounting brackets for signs of cracks or breaks	25 hours
Electrical Connector Receptacles	Attaching hexagonal nuts for mechanical tightness and damage to threads	10 hours
	Receptacle pins straight, pins and body free from corrosion and dirt	25 hours or after immersion
	Receptacle body for cracks or damage	After extreme landing impact
Access Cover and Bushing	Cover securely tightened down on bushing	Preflight
	Hexagonal nuts for mechanical tightness	10 hours
Sealing Gasket	Check for evidence of cracks or permanent distortion	10 hours
Internal mechanical components (filters, transformer, etc.)	Tightness of mounting hardware	25 hours
	Terminals free of corrosion	25 hours
Tube, relay and vibrator sockets	Free of cracks and breaks; no evidence of arcing between contacts	25 hours or at overhaul
	Contacts not bent, broken or corroded	25 hours or at overhaul
	Firm contact between contacts and mating pins	25 hours or at overhaul
Resistors	Loose wires, burned resistors (evidence of excessive current flow)	25 hours or at overhaul
Capacitors	Signs of loose pigtails, leakage of insulating compound, or physical damage	25 hours or at overhaul
Internal Wiring	Poor solder connections	25 hours or at overhaul
	Frayed, damaged or broken wires	25 hours or at overhaul
Internal areas of unit	Evidence of leakage past seal points	After immersion

5-22. TEST EQUIPMENT.

5-23. All test equipment required for bench check of the receiver is tabulated in Table II. Operation of this test equipment is not complex and does not merit a detailed discussion.

SECTION VI

FIELD AND FASRON MAINTENANCE

6-1. GENERAL.

6-2. This section contains detailed test and maintenance procedures required to localize defects and to effect the necessary repairs of an inoperative receiver. It is assumed that the maintenance specialists have been thoroughly trained in electronic maintenance practices and that they have had previous experience in performance testing, alignment, and adjustment procedures on similar types of equipment. The major percentage of troubles can be located and repaired by means of the information contained in Section V. However, if defective components other than plug-in parts are the cause of the trouble, they can be located and repaired by more experienced personnel having the necessary test equipment. Table VI includes a comprehensive trouble shooting and signal tracing procedure which can be employed to localize defective circuit components within any stage or circuit of the receiver.

6-3. MINIMUM PERFORMANCE STANDARDS.

6-4. Minimum performance standards for field maintenance activities are the same as those provided in paragraph 5-4. The equipment can be considered as operating satisfactorily for flight purposes if it meets the basic operational requirements of Table III.

6-5. SYSTEM (TROUBLE) ANALYSIS.

6-6. Table VI provides a systematic method of signal tracing through each separate section and stage of the receiver and gives normal indications to be expected. Also included are possible troubles and means of remedy in the event that a certain section does not meet the required performance standards. Trouble shooting procedures for each section are based on the assumption that the previous stages or circuits within the receiver meet the desired performance requirements. The oscilloscope presentations at the test points indicated in Table VI are to be found in the simplified schematic diagrams, figures 4-2 through 4-9. The wave forms and voltage amplitudes shown in these figures approximate those which may be found at the specific test point under normal test conditions. The actual presentation of a particular r-f or a-f wave form will vary with the type of oscilloscope and the method of test which is employed. It is recommended that maintenance personnel duplicate these wave form measurements with test equipment of their own and thus facilitate the recognition of variations in wave form presentations. Certain preliminary steps can be taken which may avoid unnecessary servicing operations before proceeding with the checks outlined in Table VI. Particular types of troubles may be located rapidly by performing the following operations prior to detailed systematic signal tracing of the receiver circuits.

6-7. Proceed with preliminary checks as follows if the equipment is defective and cannot be repaired in accordance with the instructions provided in Section V.

a. Check all electron tubes on tube tester recommended in Table II. Replace any electron tubes found to be weak, shorted or otherwise defective.

b. Check the voltage values at the points indicated on the terminal voltage diagrams, figure 7-5 or 7-6. Observe all test conditions specified on the diagram and make note of any abnormal indications. Replace the vibrator if the B+ potential is absent or abnormal.

c. Check the resistance values at all points indicated on the terminal resistance diagram, figure 7-7 or 7-8. Observe all test conditions specified on the diagram and pay particular attention to those points which show an abnormal voltage indication as previously outlined.

d. It is recommended that a systematic trouble shooting analysis of the equipment be performed as outlined in Table VI if the defect has not been located or corrected by the preliminary check.

6-8. Connect the receiver to the test equipment as shown in figure 5-1 and as instructed in paragraph 5-5 prior to starting the trouble analysis. Test points shown throughout Table VI are indicated on the master schematic diagram, figures 7-1 and 7-2. See figures 4-2 through 4-9 and figures 7-1 and 7-2 to obtain a cross reference between indicated test points and wave form presentations.

6-9. REMOVAL. Detailed instructions for removing and replacing plug-in components are provided in paragraphs 5-8 through 5-13. Follow standard electronic component replacement practices when removing other electrical parts such as resistors and capacitors.

6-10. CIRCUIT BREAKDOWN. Table VI breaks the composite equipment down into a number of separate circuits in accordance with their functions. No further circuit breakdown for trouble analysis is recommended.

6-11. SUPPLY VOLTAGE CHART. All supply voltage points are shown on the master schematic diagram, figures 7-1 and 7-2.

6-12. TUBE SOCKET VOLTAGE AND RESISTANCE CHART. Electron tube socket voltages are shown in figures 7-5 and 7-6. Electron tube socket resistances are shown in figures 7-7 and 7-8. It is recommended

TABLE VI. FIELD AND FASRON TROUBLE ANALYSIS CHART

RF TUNING UNIT

Step	Test Points	Test Equipment Conditions	Test Procedure	Normal Indication	Actual Indication	Possible Cause of Trouble	Recommended Corrective Action
1	①, receptacle J-102 and Ⓐ pin 3 of V-101.	Apply 10 microvolt r-f signal, 60% modulated by 955 cps signal, to test point ①. Connect vertical deflection plates of oscilloscope between chassis ground and each test point in turn. Adjust scope controls for steady picture.	Check for presence of a-f modulated r-f signal at test points ① and Ⓐ.	Scope presentation same at both test points, no appreciable signal loss through tuner; see waveform, figure 4-2.	Normal	---	C-101 OK.
					Weak or no signal at Ⓐ.	C-101 open.	Check and replace.
2	①; Ⓐ, Ⓑ, pin 1 of V-101; Ⓒ, pin 7 of V-101; Ⓓ, output of L-103; ⑨, pin 4 of J-101.	Same as step 1.	Check for r-f signal at test points Ⓐ and Ⓑ, audio signal at points Ⓓ and ⑨.	Scope presentation shows proper waveforms and approximate relative signal gain at each test point (see figure 4-2.)	Normal	---	RF tuning unit OK
					No signal at Ⓐ.	R-101 defective.	Check and replace.
					Weak or no signal at Ⓑ.	V-101A defective, C-107 shorted, L-102 or R-118 open.	Check tube and circuit components.
					Lack of signal at Ⓓ.	Detector misaligned.	Vary r-f input frequency to determine alignment point; realign, see paragraph 6-13.
						V-101B defective.	Check and replace.
						Oscillator inoperative; defective circuit component (L-101, C-102, C-103, C-104, C-105 or R-102.)	Measure grid bias at Ⓒ to determine if oscillator operative. If not, locate and replace defective part or replace entire RF tuning unit.
					No signal at ⑨.	R-103 or C-106 defective.	Check and replace.

AUDIO AMPLIFIER SECTION

Step	Test Points	Test Equipment Connections	Test Procedure	Normal Indication	Actual Indication	Possible Cause of Trouble	Recommended Corrective Action
3	①; Ⓔ, pin 7 of V-102A; Ⓕ, pin 6 of V-102A; Ⓖ, pin 2 of V-103; Ⓗ, pin 6 of V-103; ⑦, pin G of J-103.	Same as step 1. (Quick check for presence of audio signal can be performed by headset connected between chassis ground and test points through 0.05 uf capacitor)	Check for audio signal at test points Ⓔ, Ⓕ, Ⓖ, Ⓗ, and ⑦.	See figure 4-3 for waveforms.	Normal	---	Audio amplifier OK
					Low signal at Ⓕ.	C-108, C-124 or R-104 defective.	Check and replace.
					Improper signal at Ⓕ.	V-102A weak, R-105 defective.	Check and replace defective part.
					Excessive signal loss at Ⓖ.	C-109, C-110, R-106 or R-107 defective.	Check and replace.
					No signal or insufficient gain at Ⓗ.	V-103 or R-108 defective.	Check and replace.
					Weak signal at ⑦.	C-111 open.	Check and replace.
4	① and Ⓖ	Same as step 1	Increase a-f modulating signal slowly towards 30 kc, adjusting scope controls occasionally to check picture.	Audio signal at point Ⓖ should attenuate above approximately 6000 cycles, providing minimum signal at higher frequencies.	Signal attenuation complete.	---	Inverse feedback circuit OK.
					Low attenuation.	R-106 or C-110 values incorrect.	Replace with new component of recommended value.
5	①; Ⓙ, pin 2 of V-102B; Ⓚ, bias tap of audio filters.	Same as step 1.	Measure bias voltage at test points Ⓙ and Ⓚ with multimeter, increase signal input to 200 microvolts, recheck voltages.	Bias voltage value should increase with signal change.	Normal	---	Bias rectifier circuit OK.
					No bias voltage at Ⓙ.	V-102B, R-110 or C-112 defective.	Check and replace.
					No bias gain with signal increase.	V-102B or C-112.	
					No bias at Ⓚ.	R-109 or C-113.	

FILTER AND RELAY SECTION FOR R-196C/ARW-26Y

Step	Test Points	Test Equipment Connections	Test Procedure	Normal Indication	Actual Indication	Possible Cause of Trouble	Recommended Corrective Action
6	①; Ⓛ, output tap of audio filter Z-105; Ⓜ, pin 7 of V-106; Ⓝ, pin 8 of V-106.	Same as step 1.	Check waveforms at Ⓛ and Ⓜ for proper gain. Measure bias voltage at Ⓛ and Ⓜ, cathode voltage at Ⓝ, using multimeter.	Typical waveforms shown in figure 4-5. Bias voltage should be approximately same as step 5, with 10 microvolt input. Cathode voltage at Ⓝ +26.5 V dc.	Normal	---	Filter circuit OK
					Low signal or bias at Ⓛ.	Z-105 defective.	Check and replace.
					No signal or bias at Ⓜ.	R-115 open.	Check and replace.
					Low cathode voltage at Ⓝ.	Improper d-c voltage input.	Check voltage from external supply.
7	① and ② pin B of J-104.	Same as step 1.	Observe milliammeter and parachute test lamp on test box.	Current should be approximately 6.5 ma; parachute channel lamp should glow.	Normal	---	Relay control circuit OK
					Low or no relay current.	V-106A defective.	Check and replace.
						C-118 shorted.	Check and replace.
						Relay coil open.	Check and replace.
					Relay current OK; no test lamp indication.	Relay contacts defective.	Check and replace.
8	① and ②	Same as step 1.	Slowly rotate "RELAY CURRENT" knob on test box counterclockwise, watching parachute lamp.	Lamp will extinguish at drop-out current (not less than 1.5 ma.)	Readings vary widely from normal.	Relay defective.	Check and replace.
			Reverse direction of knob rotation, check lamp.	Note: For greatest accuracy, subtract zero modulation current from total reading obtained.			
				Lamp will light at pull-in current (approx. 2.75 ma).			

FILTER RELAY SECTION FOR R-196C/ARW-26Y (cont)

Step	Test Points	Test Equipment Connections	Test Procedure	Normal Indication	Actual Indication	Possible Cause of Trouble	Recommended Corrective Action
9	① and ②	Same as step 1.	Turn off input signal. Observe test lamp and milliammeter.	Test lamp should glow for 1/2 to one second after signal removal, then extinguish. Meter reading drops to less than 0.2 ma.	Normal	---	Delay circuit OK; receiver noise not excessive.
					No delay	C-123 open.	Replace.
					High ma current indication.	Noisy vibrator or tubes.	Check and replace.
10	①, ③, ④, ⑤, ⑥, Pins C, B, D and E of J-105.	Same as step 1, except a-f modulating signal.	Modulate r-f with a-f signals of 300, 650, 1390 and 3000 cycles in turn. Perform steps 6, 7 and 8 at each frequency to check other four control channels. Use similar test points for respective channels. Depress S-101 to check individual channel current. (Total current approx. 12.5 ma.)	Same as steps 6, 7 and 8. (current on 300, 650, 1390 and 3000 channels will be approx. 0.5 ma ± 10% with switch depressed)		Same as steps 6, 7 and 8.	
11	①, ②, ③, and Ⓟ, pin 2 of V-106B.	Same r-f signal as step 1, modulated 60% with 300 cps audio signal.	Check for operation of test lamps; observe milliammeter indication. Check d-c voltage at point Ⓟ.	Parachute lamp should light simultaneously with 300 cycle channel lamp. Meter should indicate approx. 12.5 ma. Voltage at Ⓟ should be approx. 17 to 20 V dc.	Normal	---	Parachute holding circuit OK
					No parachute lamp; low current reading; improper voltage at Ⓟ.	V-106B defective.	Check and replace.
						Defective relay.	Check all relays.
						R-117 or R-116 defective.	Check and replace.
12	---	No signal input.	Check relay current with r-f input.	Should be less than 0.2 ma.	Normal	---	Vibrator noise OK
					High current.	Vibrator noisy.	Check and replace.

FILTER AND RELAY SECTION FOR R-196D/ARW-26Y

Step	Test Points	Test Equipment Connections	Test Procedure	Normal Indication	Actual Indication	Possible Cause of Trouble	Recommended Corrective Action
13	(2); (L); (M); (Q); pin 8 of V-106: (R), junction of R-116 and R-121.	Same as step 1.	Check waveforms at (L) and (M) for proper gain. Measure bias voltage at (L), and (M), cathode voltage at (Q) and ground at (R).	See figure 4-5 for typical waveforms. Bias should be same as in step 5. See figure 7-6 for Voltage at (Q).	Normal.	---	Filter circuit OK.
					Low signal or bias at (L).	Z-105 defective.	Check and replace.
					No signal or bias at (M).	R-115 open.	Check and replace.
					Low cathode voltage at (Q).	C-123 or R-116 defective.	Check and replace.
					No ground at (R).	K-101, K-102, K-103 or K-104 contacts defective.	Check and replace.
14	(1) and (2).	Same as step 1.	Observe milliammeter and parachute test lamp on test box.	Current should be approximately 6.5 ma; parachute channel lamp should glow.	Normal.	---	Relay control circuit OK
					Low or no relay current	V-106 defective	Check and replace.
						C-129 or R-120 defective.	Check and replace.
						Relay coil open.	Check and replace relay.
					Relay current OK; no test lamp indicator.	Relay contacts defective.	Check and replace relay.
15	(1) and (2).	Same as step 1.	Slowly rotate "RELAY CURRENT" knob on test box counterclockwise, watching parachute lamp.	Lamp will extinguish at drop-out current (not less then 1.5 ma).	Readings vary widely from normal.	Relay defective.	Check and replace.
			Reverse direction of knob rotation, check lamp.	Note: For greatest accuracy subtract zero modulation current from reading obtained.			
				Lamp will light at pull-in current approx. 2.75 ma).			

FILTER RELAY SECTION FOR R-196D/ARW-26Y (cont)

Step	Test Points	Test Equipment Connections	Test Procedure	Normal Indication	Actual Indication	Possible Cause of Trouble	Recommended Corrective Action
16	①, and ②,	Same as step 1.	Repeat procedure in step 9 for R-196D/ARW-26Y.	Same as in step 9.	Normal.	---	Delay circuit OK; receiver noise not excessive.
					No delay	C-123 or C-129 defective.	Check and replace.
					High ma current indication.	Noisy vibrator or tubes.	Check and replace.
17	①; ③; ④; ⑤; and ⑥.	Same as step 1, except a-f modulating signal.	Repeat procedure in step 10 for R-196D/ARW-26Y.	Same as in step 10.		Same as in step 10.	
18	①; ②; ③; and Ⓢ, pin 2 of V-106.	Same r-f signal as step 1, modulated 60% with 300 cps audio signal.	Check for operation of test lamps; observe milliammeter indication; check d-c voltage at point Ⓢ.	Parachute lamp should light simultaneously with 300 cycle channel lamp. Meter should indicate approx. 12.5 ma. Voltage at Ⓢ should be approx. 23 V dc.	Normal.	---	Parachute holding circuit OK.
					No parachute lamp, low current reading, improper voltage at Ⓢ.	V-106 defective.	Check and replace.
						Defective relay.	Check all relays.
						R-121 defective.	Check and replace.
19	---	No signal input.	Check relay current with no r-f input.	Should be less than 0.2 ma.	Normal.	---	Vibrator noise OK.
					High current.	Vibrator noisy.	Check and replace.

POWER SUPPLY SECTION FOR R-196C/ARW-26Y

Step	Test Points	Test Equipment Connections	Test Procedure	Normal Indication	Actual Indication	Possible Cause of Trouble	Recommended Corrective Action
20	(T), pin 1 of T-101; (U), pin 3 of T-101; (V), pin 4 of T-101; (W), pin 5 of T-101; (X), pin 6 of T-101.	26.5 V dc applied to pin D of J-103.	Using proper multimeter scales, check d-c voltages between test points and ground.	Correct voltages shown in figure 7-5.	Normal	---	Voltage output OK
					Low or no voltage	CR-101	Check and replace.
						T-101, L-104, C-120 or C-125 defective.	Check and replace
			Check a-c voltages between (T) and (U), (V) and (X).		Low a-c voltage between (V) and (X), no voltage at (W).	C-121 shorted.	Check d-c resistance to ground (1-10 meg). Replace if necessary.

POWER SUPPLY SECTION FOR R-196D/ARW-26Y

Step	Test Points	Test Equipment Connections	Test Procedure	Normal Indication	Actual Indication	Possible Cause of Trouble	Recommended Corrective Action
21	(Y), pin 1 of T-101; (Z), pin 3, of T-101; (AA), pin 4 of T-101; (BB), pin 5 of T-101; (CC), pin 6 of T-101.	Same as step 20	Using proper multimeter scales, check d-c voltages between test points and ground.	Correct voltages shown in figure 7-6.	Normal	---	Voltage output OK
					Low or no voltage.	CR-101	Check and replace.
						T-101, L-104, L-105, C-121, C-125, C-130 defective.	Check and replace.
			Check a-c voltages between (Y) and (Z), (AA) and (CC).		Low a-c voltage between (AA) and (CC), no voltage at (BB).	C-118 shorted.	Check d-c resistance to ground (1-10 meg). Replace if necessary.

that maintenance personnel duplicate these measurements with test equipment of their own and thus facilitate the recognition of variations in voltage and resistance values.

6-13. ALIGNMENT AND ADJUSTMENTS. The receiver should be realigned to the desired control frequency before it is installed within the target drone or after major repairs have been performed. The receiver is aligned to provide a reception frequency of 73 megacycles when shipped from the factory. A check of this frequency or realignment to any other desired reception frequency within the tuning range of 57 to 74 megacycles can be accomplished by the following method. Either the TS-257/ARW or the alternate test set shown in figure 2-5 may be employed to align the receiver.

a. Connect the receiver and the associated test equipment as shown in figure 5-1. A power source of 26.5 volts dc must be available to provide operating power for the receiver.

b. Remove the ten attaching screws and the case to provide access to the "RELAY TEST" switch on the chassis. (See figure 6-1.)

c. Apply power to the equipment by positioning the off-on switch on the test set to on. Allow two to three minutes for receiver components to reach a stable operating temperature.

d. Check voltmeter on test set to determine that the power supply potential is approximately 26.5 volts dc.

e. Adjust the r-f signal generator to the reception frequency at which receiver alignment is desired.

f. Adjust the audio oscillator to 955 cycles within plus or minus three percent. Control the audio oscillator output voltage to provide approximately 60 percent of r-f signal modulation.

g. Remove the protective cap from the "TUNING ACCESS" aperture on the front panel.

h. A 955 cycle tone will be heard in the monitoring headphones if the r-f input circuit of the receiver is in approximate alignment with the incoming r-f signal. In addition, the parachute or 955 cycle channel indicating lamp on the test set will illuminate and indicate that the related relay has been actuated by the incoming signal.

i. Employ a small screwdriver of the proper size and adjust the "TUNING ACCESS" screw until the 955 cycle tone is at maximum volume in the headphones. (See figure 6-2.)

j. Maintain the r-f signal level low enough so that a peak can be sharply defined and adjust the "TUNING ACCESS" screw for maximum relay current as indicated on the test set milliammeter.

k. Replace the protective cap in the "TUNING ACCESS" aperture after the r-f tuning unit has been aligned. Check the milliammeter on the test set for approximately 6.5 milliamperes of relay current with the 955 cycle input signal applied.

l. Check the receiver by means of the check procedures outlined in Table III to ascertain that proper operation is being obtained and that the equipment is satisfactory for installation within the target drone.

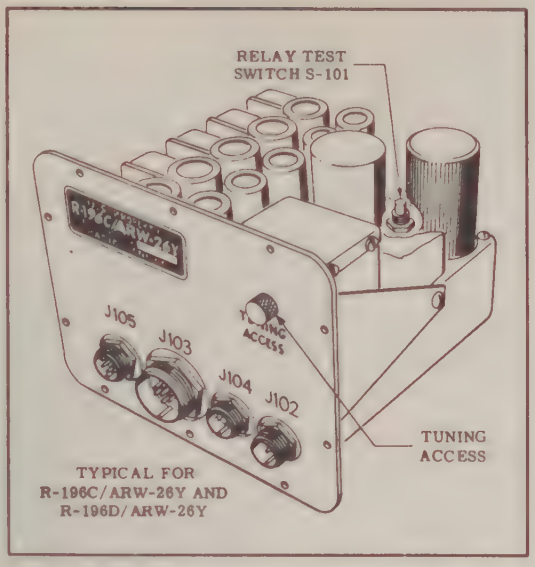

Figure 6-1. Radio Receiver-Selector R-196C/ARW-26Y and R-196D/ARW-26Y, Tuning Controls

6-14. LUBRICATION. No lubrication is required for any part of the equipment.

6-15. MAINTENANCE AND INSPECTION SCHEDULE. The inspection procedures provided in Table V cover all necessary visual or physical checks that should be performed on the receiver. It is recommended that the receiver be removed from the target drone and be submitted to the check procedures outlined in Table III after each ten hours of operation. The need for further maintenance or inspection schedules is eliminated due to the relatively simple nature of the equipment.

6-16. OVERHAUL SCHEDULE. The need for overhaul of the equipment at routine intervals is also eliminated due to the relatively simple nature of the equipment. Overhaul of the receiver should be undertaken only when major troubles occur to prevent proper operation.

6-17. BENCH TEST SET-UP. The bench test set-up illustrated in figure 5-1 is applicable to both operational and field maintenance procedures.

6-18. TEST EQUIPMENT. All test equipment required for both operational and field maintenance bench check of the receiver is tabulated in Table II. Operation of this test equipment is simple and does not merit a detailed discussion.

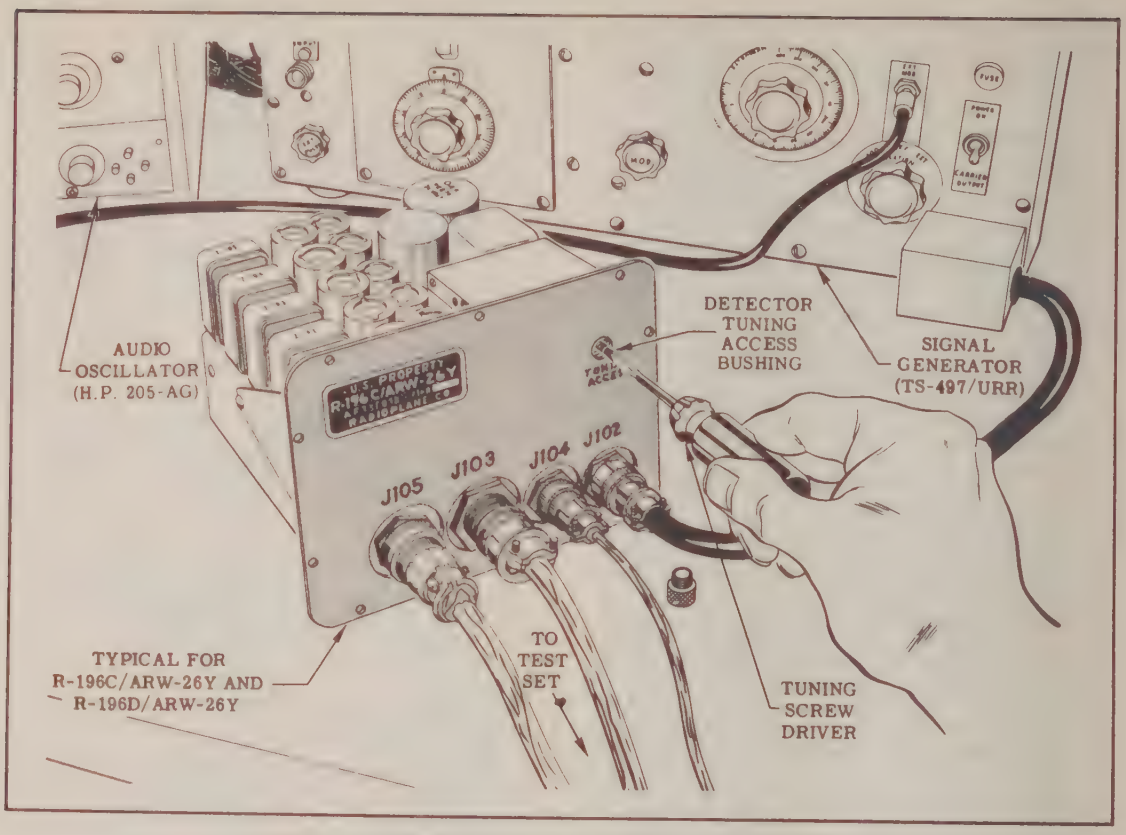

Figure 6-2. Adjustment of Radio Frequency Tuning Unit Slug

SECTION VII

DIAGRAMS

7-1. GENERAL.

7-2. Included in this section are schematic and practical wiring diagrams required for proper servicing of the Radio Receiver-Selector R-196C/ARW-26Y and R-196D/ARW-26Y. A JAN and RMA color code chart, terminal voltage diagrams, and terminal resistance diagrams are also included to facilitate the check of circuit conditions.

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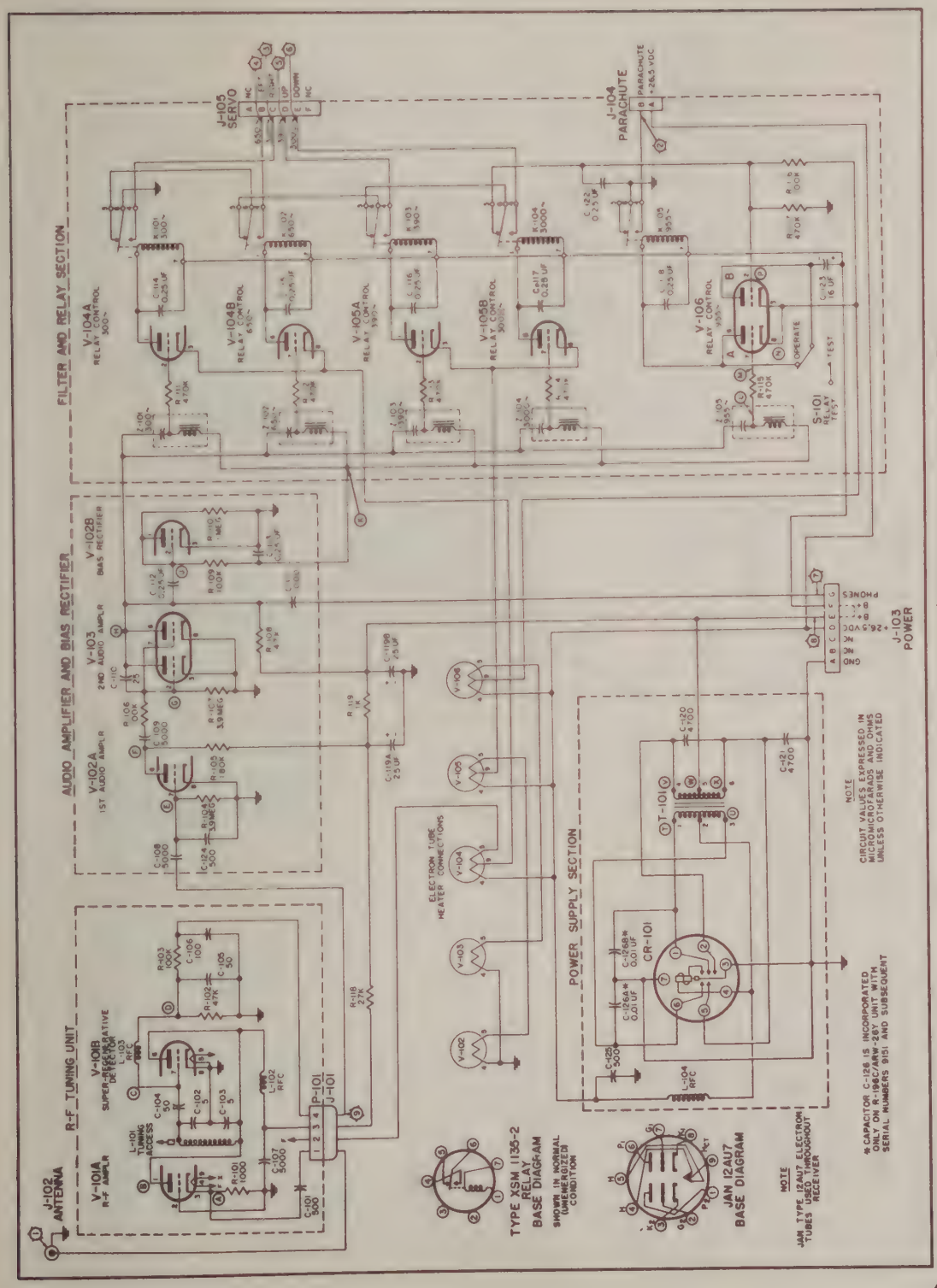


Figure 7-1. Radio Receiver-Selector R-196C/ARW-26Y, Master Schematic Diagram

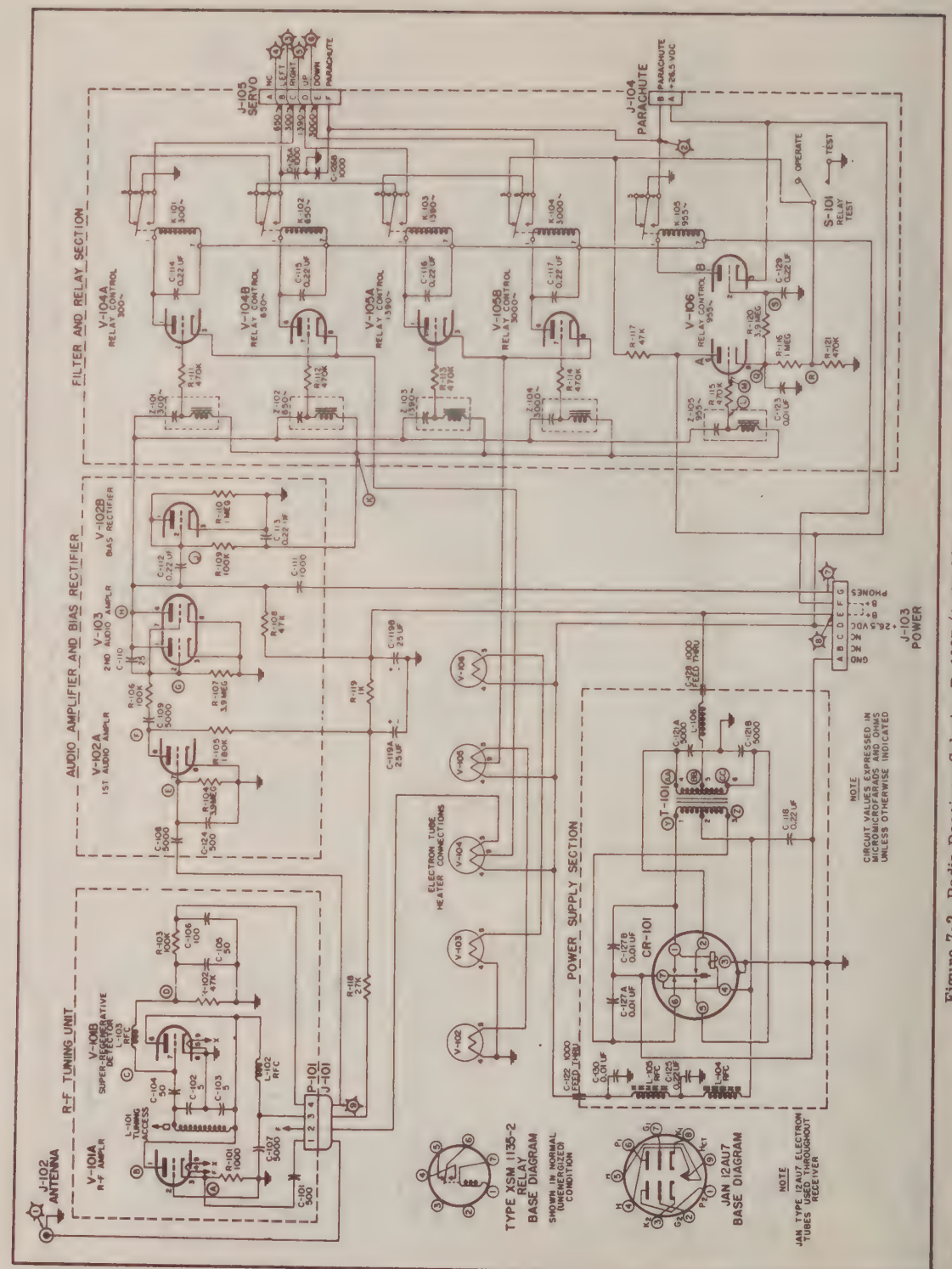


Figure 7-2. Radio Receiver-Selector R-196D/ARW-26Y, Master Schematic Diagram

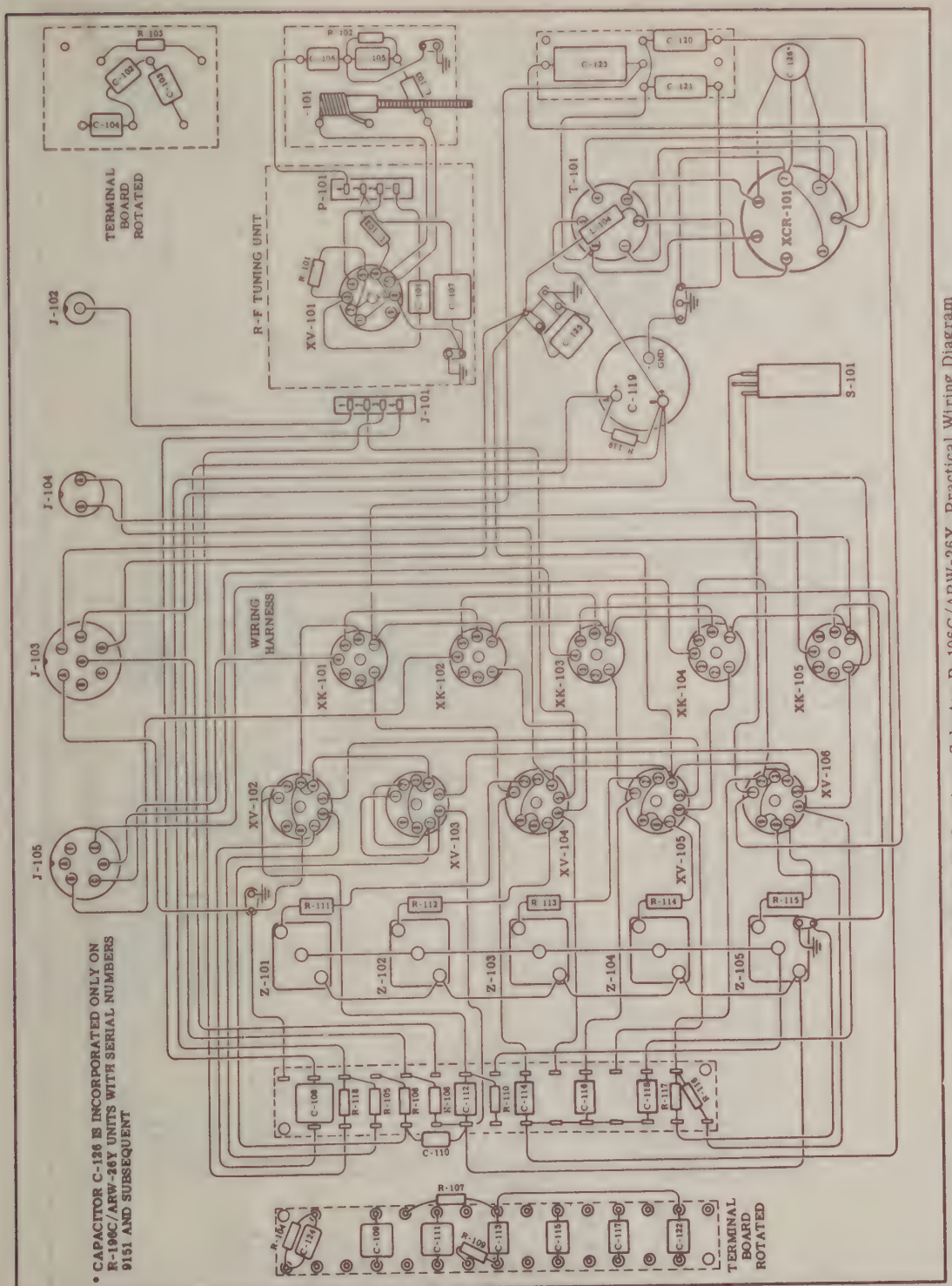


Figure 7-3. Radio Receiver-Selector R-196C/ARW-26Y, Practical Wiring Diagram

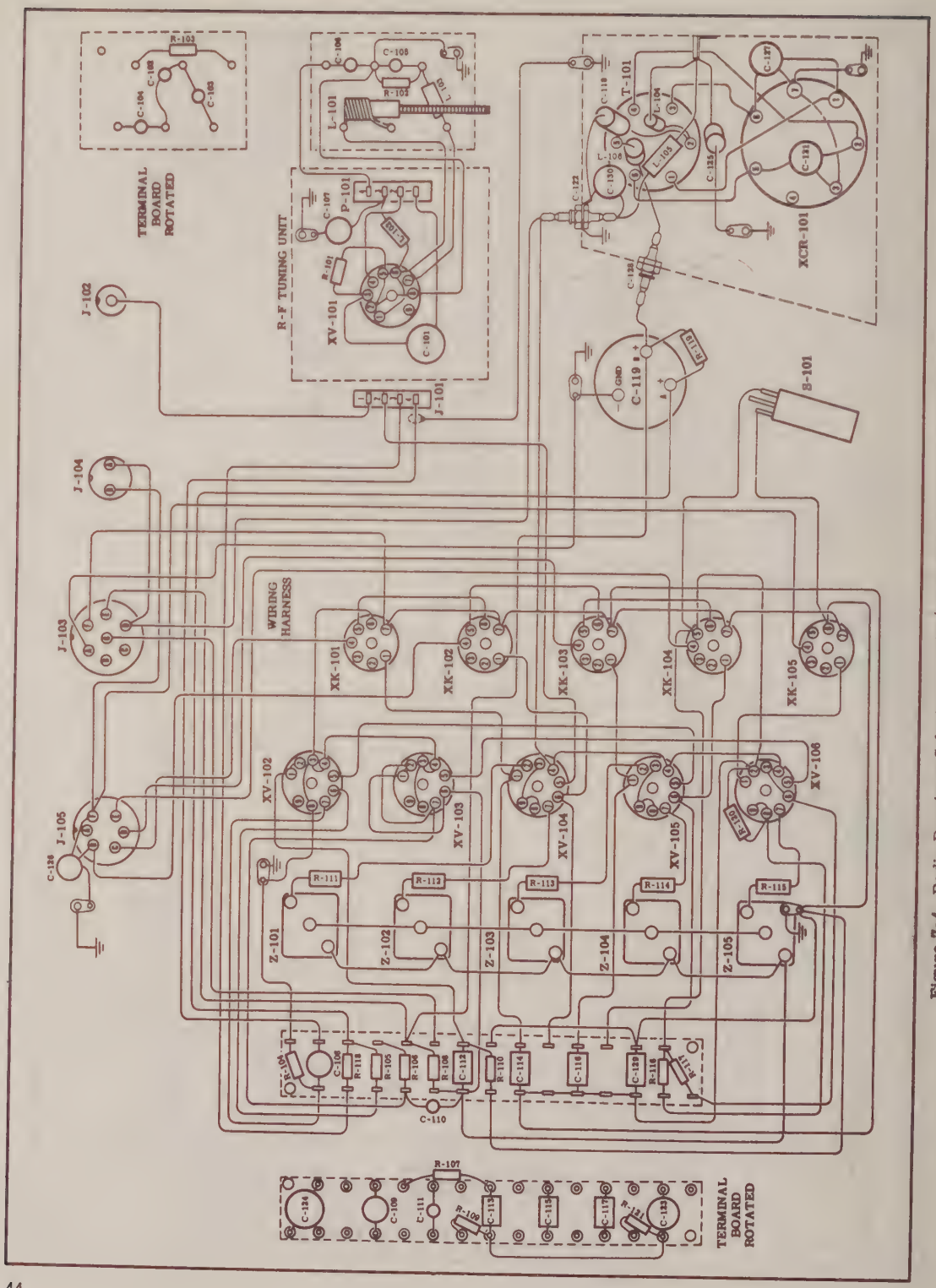
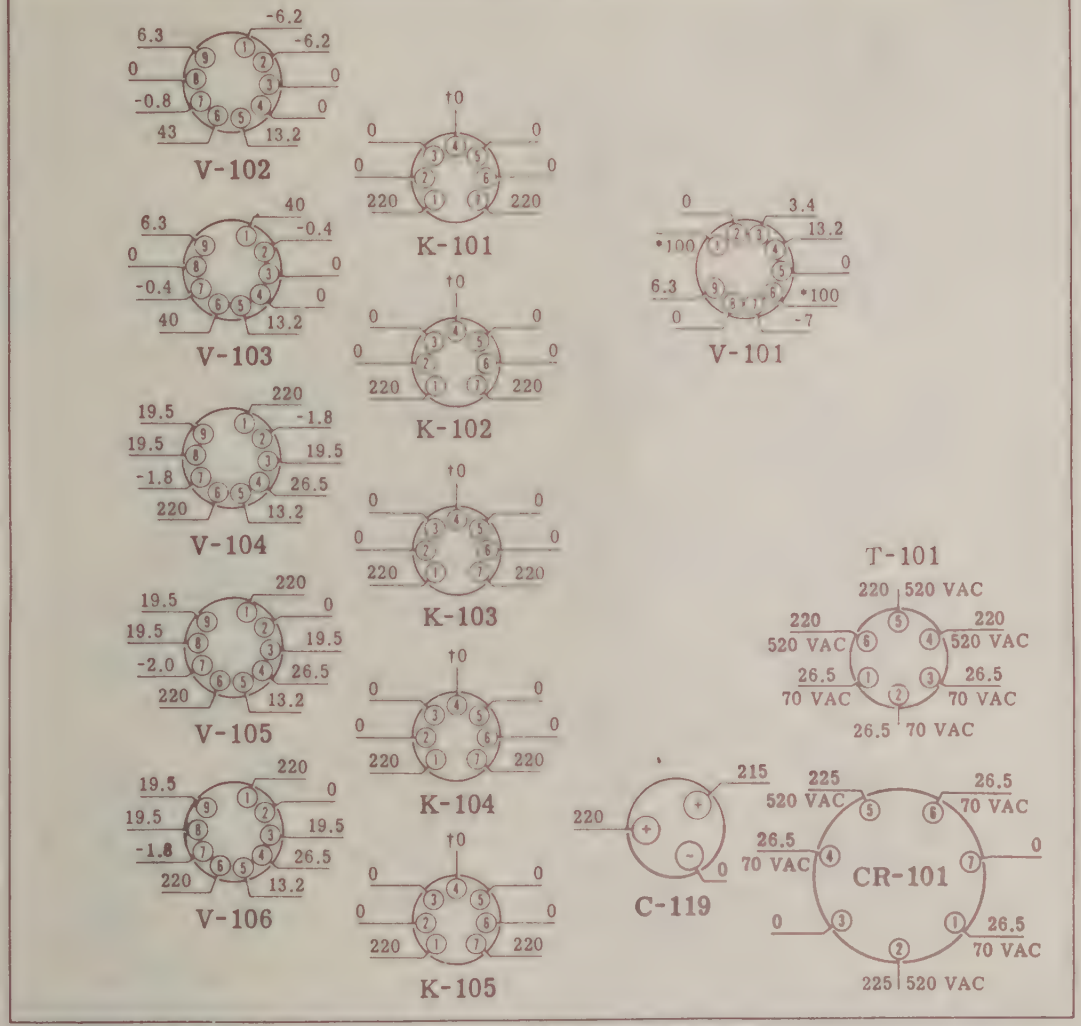


Figure 7-4. Radio Receiver-Selector R-196D/ARW-26Y, Practical Wiring Diagram

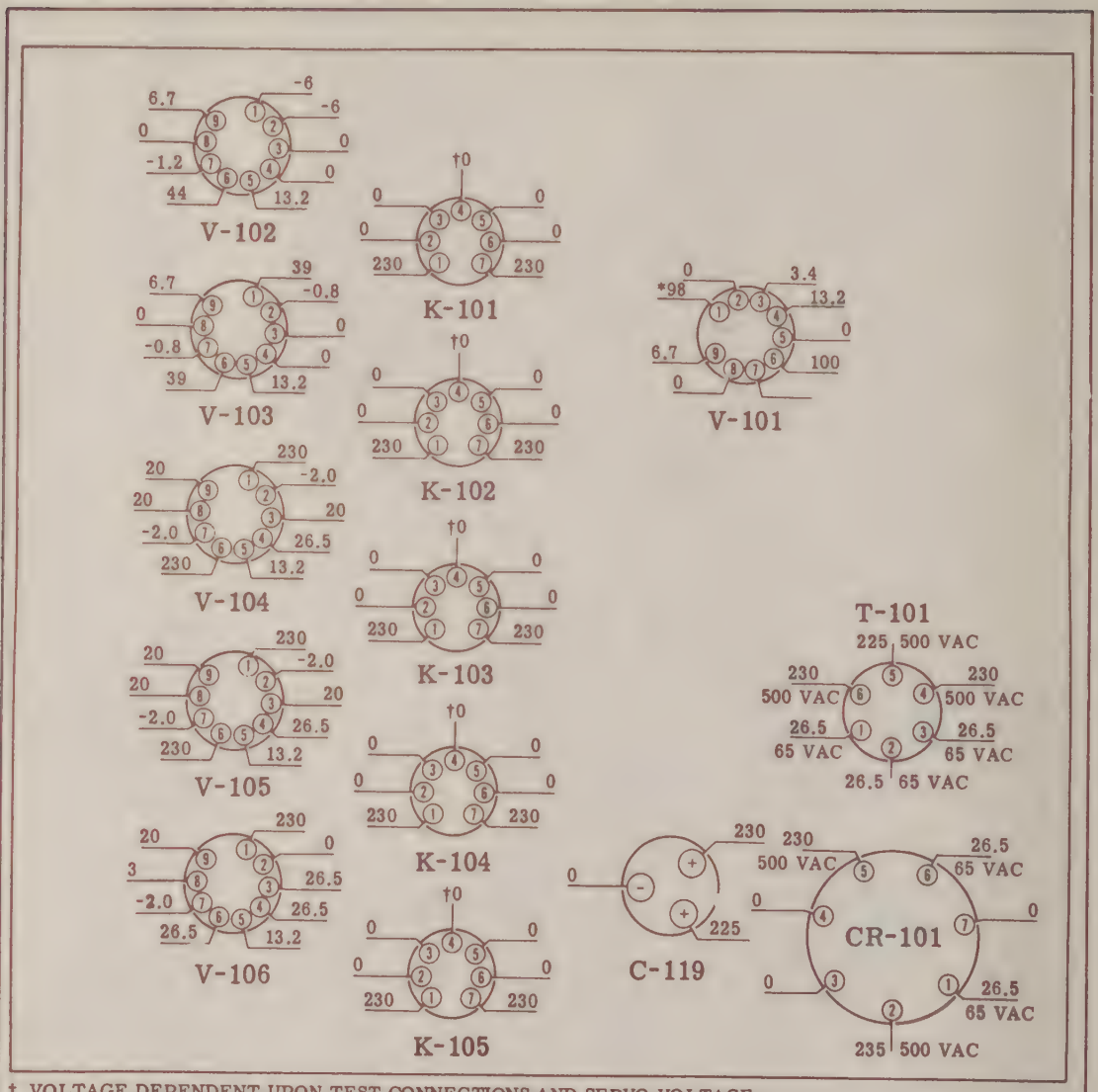


† VOLTAGE DEPENDENT UPON TEST CONNECTIONS AND SERVO VOLTAGE.
* 50,000 OHM RESISTOR IN SERIES WITH TEST LEAD.

TEST CONDITIONS

1. TEST CABLES CONNECTED
2. NO R-F SIGNAL INPUT
3. INPUT VOLTAGE: 26.5 V DC
4. MEASUREMENTS TAKEN WITH 20,000 OHMS-PER-VOLT METER
5. ALL VOLTAGES ARE DIRECT CURRENT UNLESS OTHERWISE INDICATED
6. ALL MEASUREMENTS MADE BETWEEN INDICATED POINTS AND GROUND

Figure 7-5. Radio Receiver-Selector R-196C/ARW-26Y, Terminal Voltage Diagram

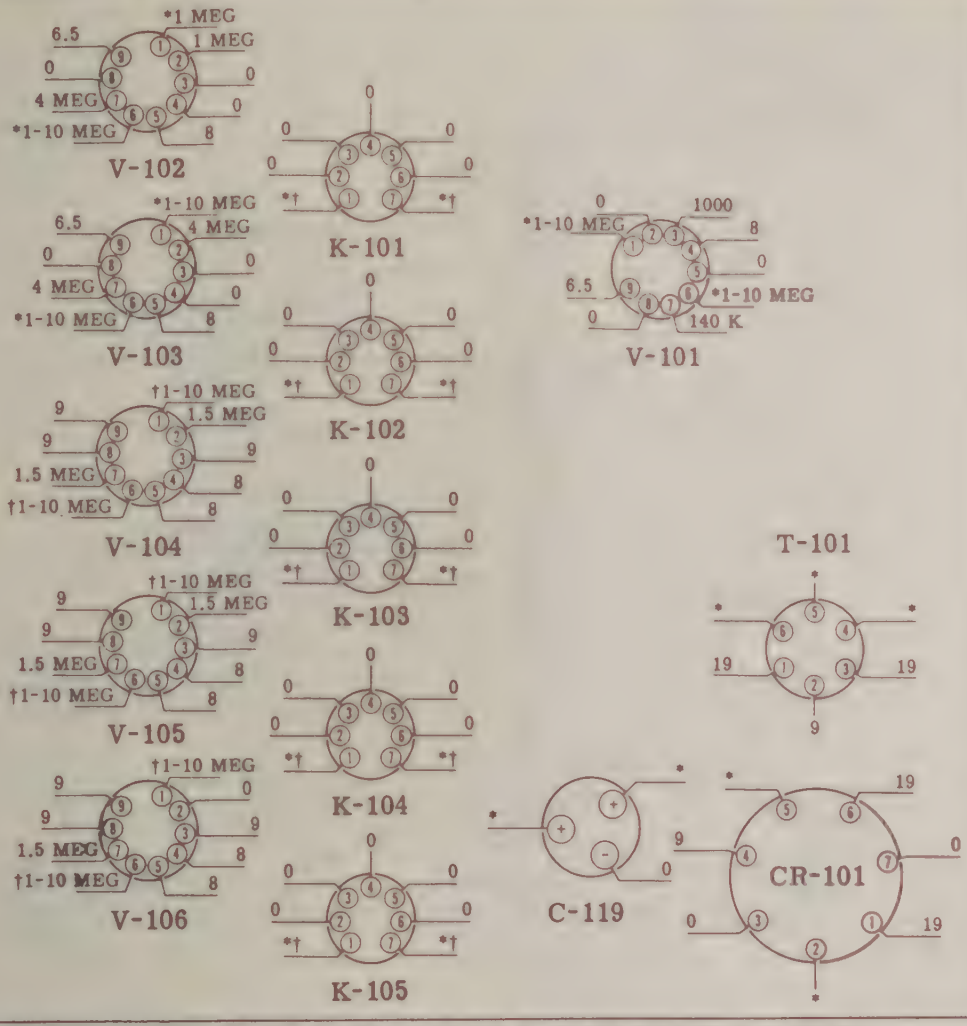


† VOLTAGE DEPENDENT UPON TEST CONNECTIONS AND SERVO VOLTAGE
* 50,000 OHM RESISTOR IN SERIES WITH TEST LEADS

TEST CONDITIONS

1. TEST CABLES CONNECTED
2. NO R-F SIGNAL INPUT
3. INPUT VOLTAGE: 26.5 V DC
4. MEASUREMENTS TAKEN WITH 20,000 OHMS-PER-VOLT METER
5. ALL VOLTAGES ARE DIRECT CURRENT UNLESS OTHERWISE INDICATED
6. ALL MEASUREMENTS MADE BETWEEN INDICATED POINTS AND GROUND

Figure 7-6. Radio Receiver-Selector R-196D/ARW-26Y, Terminal Voltage Diagram

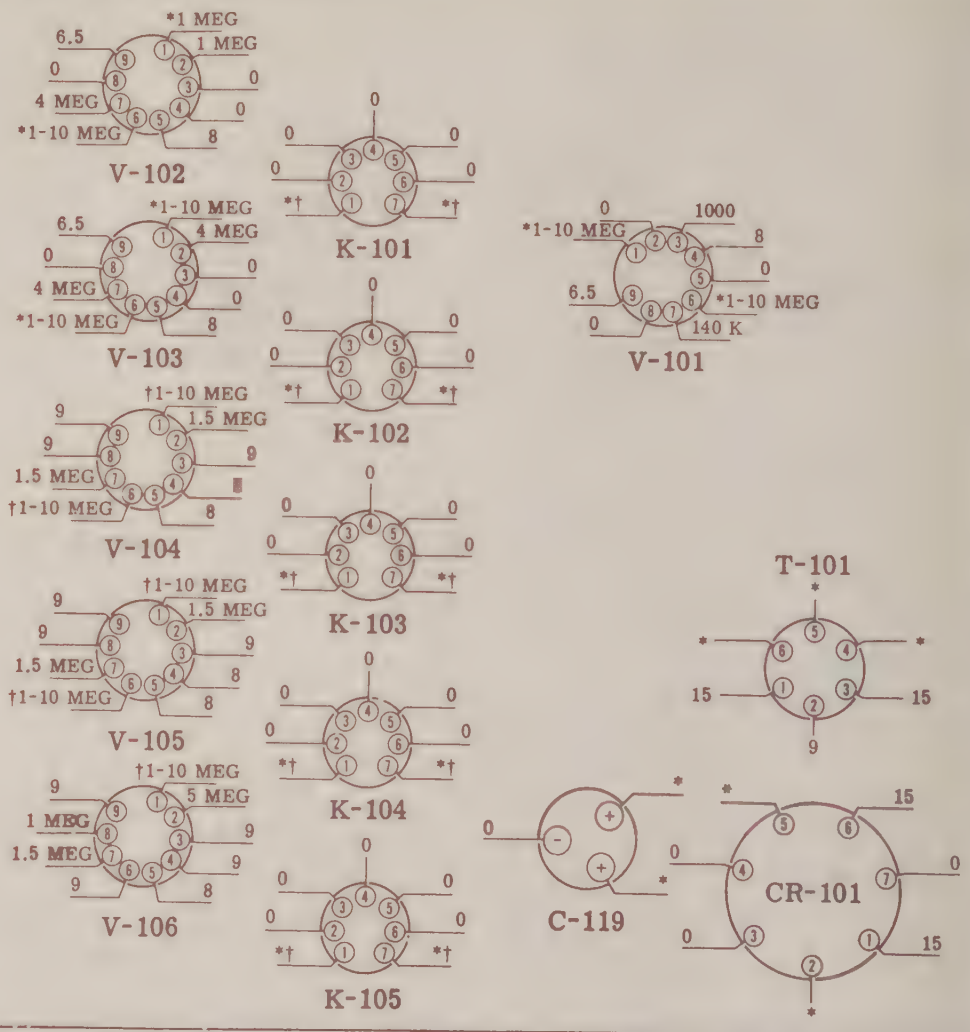


* THIS MEASURMENT INVOLVES THE DISCHARGE OF THE B+ FILTER CAPACITOR TO GROUND
† THIS MEASUREMENT MUST BE MADE WITH JUMPER BETWEEN PINS E AND F OF J-103

TEST CONDITIONS

1. NO CABLES CONNECTED TO EXTERNAL RECEPTACLES
2. ALL PRIMARY POWER REMOVED
3. MEASUREMENTS MADE BETWEEN INDICATED POINTS AND GROUND
4. RESISTANCE VALUES EXPRESSED IN OHMS UNLESS OTHERWISE INDICATED
5. LOWEST POSSIBLE RESISTANCE SCALE USED FOR ALL MEASUREMENTS
6. K INDICATES 1000 OHMS. MEG INDICATES MILLION OHMS

Figure 7-7. Radio Receiver-Selector R-196C/ARW-26Y, Terminal Resistance Diagram



* THIS MEASUREMENT INVOLVES THE DISCHARGE OF THE B+ FILTER CAPACITOR TO GROUND
† THIS MEASUREMENT MUST BE MADE WITH JUMPER BETWEEN PINS E AND F OF J-103

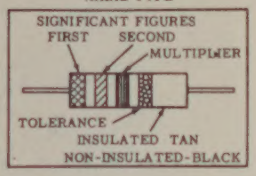
TEST CONDITIONS

1. NO CABLES CONNECTED TO EXTERNAL RECEPTACLES
2. ALL PRIMARY POWER REMOVED
3. MEASUREMENTS MADE BETWEEN INDICATED POINTS AND GROUND
4. RESISTANCE VALUES EXPRESSED IN OHMS UNLESS OTHERWISE INDICATED
5. LOWEST POSSIBLE RESISTANCE SCALE USED FOR ALL MEASUREMENTS

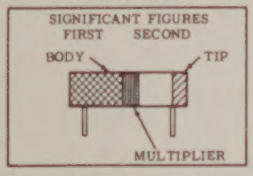
Figure 7-8. Radio Receiver-Selector R-196D/ARW-26Y, Terminal Resistance Diagram

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE

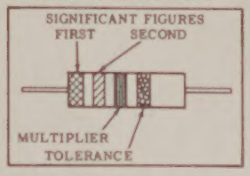


RADIAL TYPE

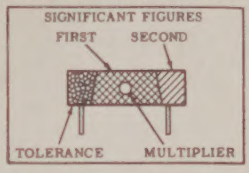


JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE INSULATED

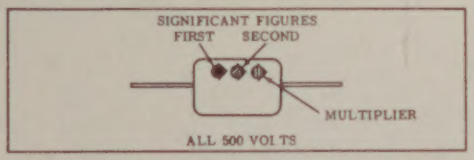


RADIAL TYPE NON-INSULATED

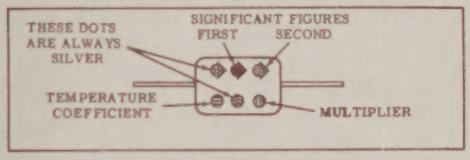


CAPACITOR COLOR CODE

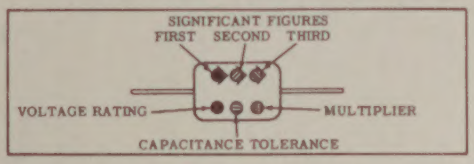
RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



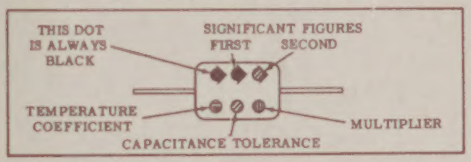
JAN 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS



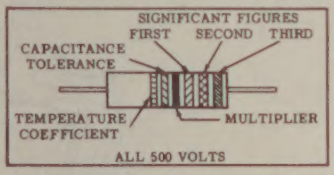
RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



JAN 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

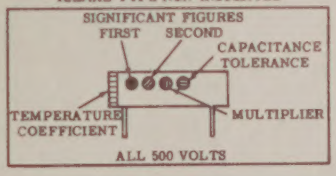


RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS

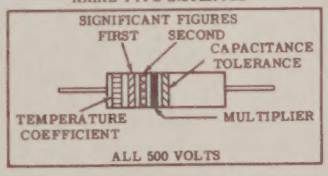


JAN COLOR CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS

RADIAL TYPE NON-INSULATED



AXIAL TYPE INSULATED



RESISTORS				CAPACITORS				
TOLERANCE	MULTIPLIER	SIGNIFICANT FIGURE	COLOR	MULTIPLIER: RMA MICA AND CERAMIC-DIELECTRIC	MULTIPLIER: JAN MICA AND PAPER-DIELECTRIC	MULTIPLIER: JAN CERAMIC DIELECTRIC	VOLTAGE RATING	TEMPERATURE COEFFICIENT
	1	0	BLACK	1	1	1		A
	10	1	BROWN	10	10	10	100	B
	100	2	RED	100	100	100	200	C
	1,000	3	ORANGE	1,000	1000	1000	300	D
	10,000	4	YELLOW	10,000			400	E
	100,000	5	GREEN	100,000			500	F
	1,000,000	6	BLUE	1,000,000			600	G
	10,000,000	7	VIOLET	10,000,000			700	
	100,000,000	8	GRAY	100,000,000		0.01	800	
	1,000,000,000	9	WHITE	1,000,000,000		0.1	900	
5	0.1		GOLD	0.1	0.1		1000	
10	0.01		SILVER	0.01	0.01		2000	
20			NO COLOR				500	

RMA: RADIO MANUFACTURERS ASSOCIATION JAN: JOINT ARMY-NAVY

Figure 7-9. JAN and RMA Color Codes for Capacitors and Resistors